February 2012

Lunar Mapper V2.0

User's manual

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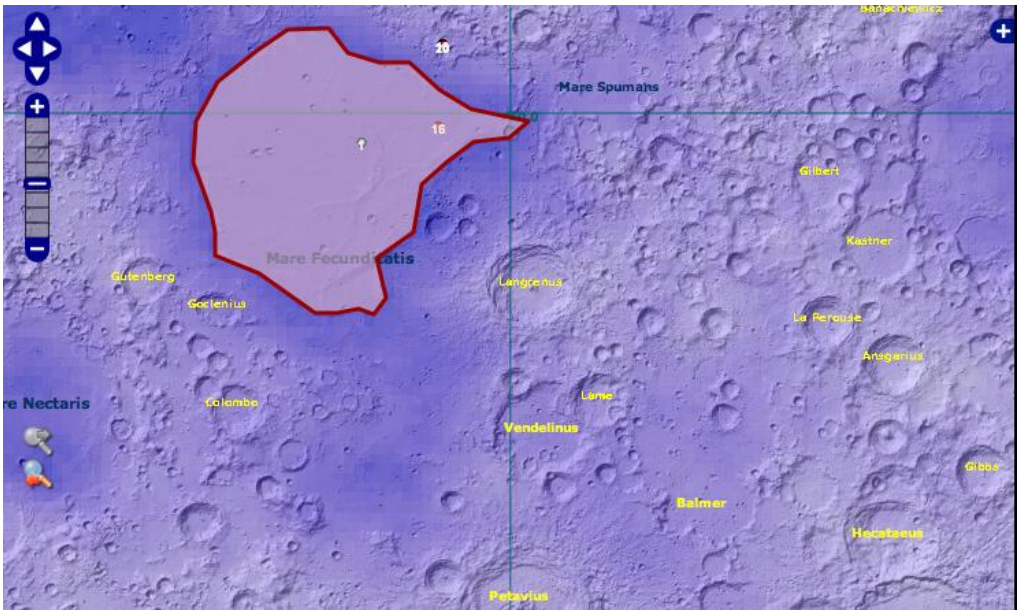

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1 Introduction

1.1 Web based tool for viewing lunar data

Welcome to Lunar Mapper. This is a web-based digital overlay tool (Fig. 1.1) designed to support the NASA Lunar Mapping and Modeling Program (LMMP).

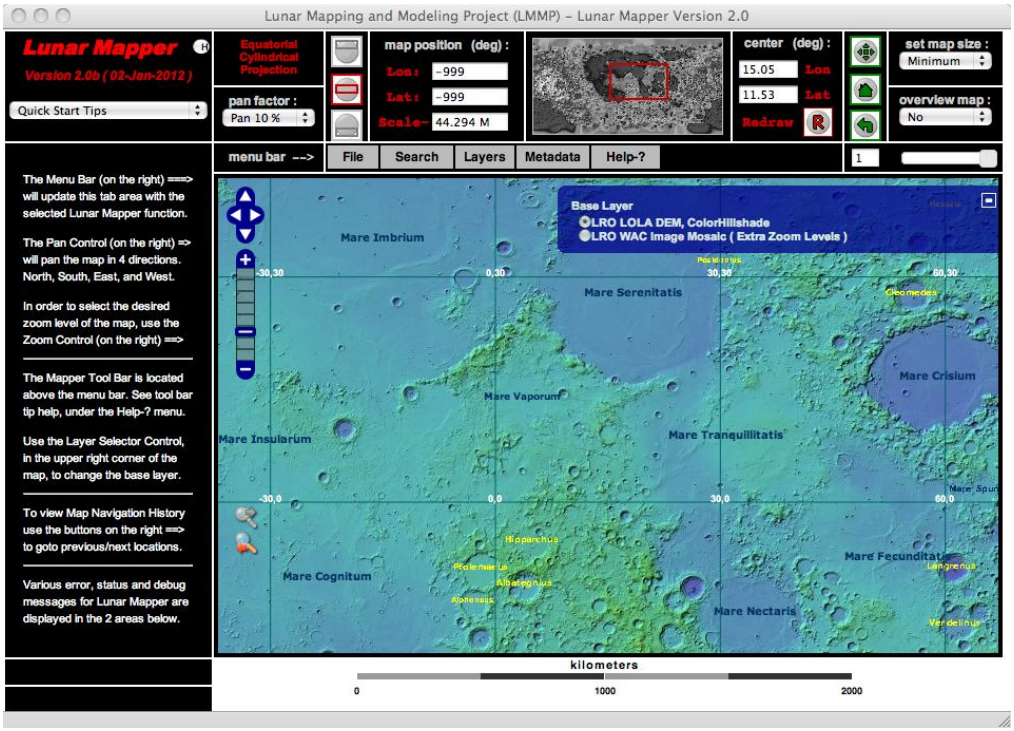

Figure 1.1. Lunar Mapper interface.

This tool allows you to display and examine available lunar data including:

- Image mosaics.
- Topography.
- Nomenclature.
- Mineralogy.

Furthermore, you can overlay different data sets to aid various types of research or mission planning. Additionally, you can add the following annotations to maps:

- Points.

- Lines.
- Polygons.

The data and imagery used by Lunar Mapper come from several sources, including Lunar Rover missions, the Clementine Orbiter, Lunar Orbiter, and the Apollo missions. New data are added to the LMMP infrastructure as they become available. This may change the menu options as these data are added; therefore, the appearance of the menus in this manual may differ from what is available in Lunar Mapper in the future.

The source information (metadata) for the available data can be accessed via Lunar Mapper as well.

1.2 System requirements

Lunar Mapper is designed to work with the following internet browsers:

- Microsoft Internet Explorer v. 7.
- Safari v. 3 or higher.
- Firefox v. 3 or higher.

We have tested Lunar Mapper on the following platforms:

- Windows XP.
- Mac OS X.
- iPhone 4/ iPad (limited functionality, see section 9.5).

The minimum screen resolution needed is:

- 960 × 686 without overview map.
- 1240 × 748 to use overview map.

1.3 Lunar Mapper Functionality

The Lunar Mapper v2.0 software provides the following functionality:

- Navigate to a point of interest on the surface of the Moon using search tools.
- View available vector and raster data, nomenclature, and the associated metadata. This includes equatorial and polar projected data.

- View information about the current view and data, such as map scale, data legend, and current position.
- Overlay vector and raster data including:

    1. Layer ordering, removal, and restore.
    2. Control of layer transparency.
    3. Addition of map annotations (e.g., points, lines, polygons).

- Report attributes of lunar features (Craters, Rima, Mare, etc.), such as crater diameter and location.
- Online user help.
- Accessibility by providing keyboard equivalents for mouse functions that control zooming and panning.
- Layout maps for printing and presenting graphics.

2 Quick Start

2.1 Access

Lunar Mapper (Lunar Mapping and Modeling Project [LMMP]) is accessed through the LMMP Portal:

http://pub.lmmp.nasa.gov/

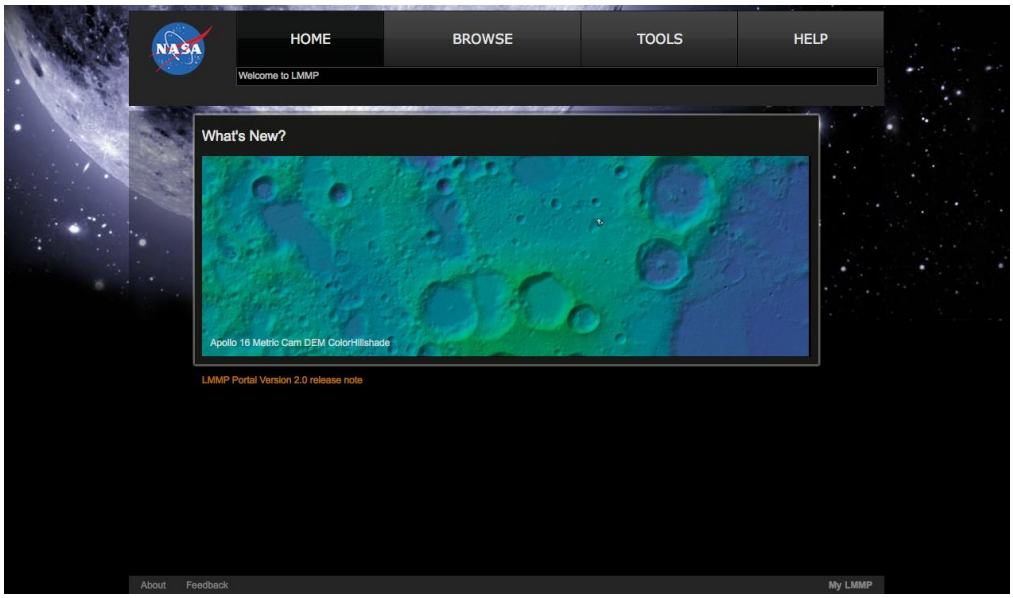

Figure 2.1. Portal interface.

Once the portal page displays, start Lunar Mapper v2.0 by selecting the *TOOLS* tab and then selecting the *Lunar Mapper* icon (Fig. 2.2). On the first use of Lunar Mapper, a launch window will appear that shows the system requirements for running Lunar Mapper. After you choose *Launch*, licensing information will be displayed. You will need to accept the terms of the license agreement to use Lunar Mapper.

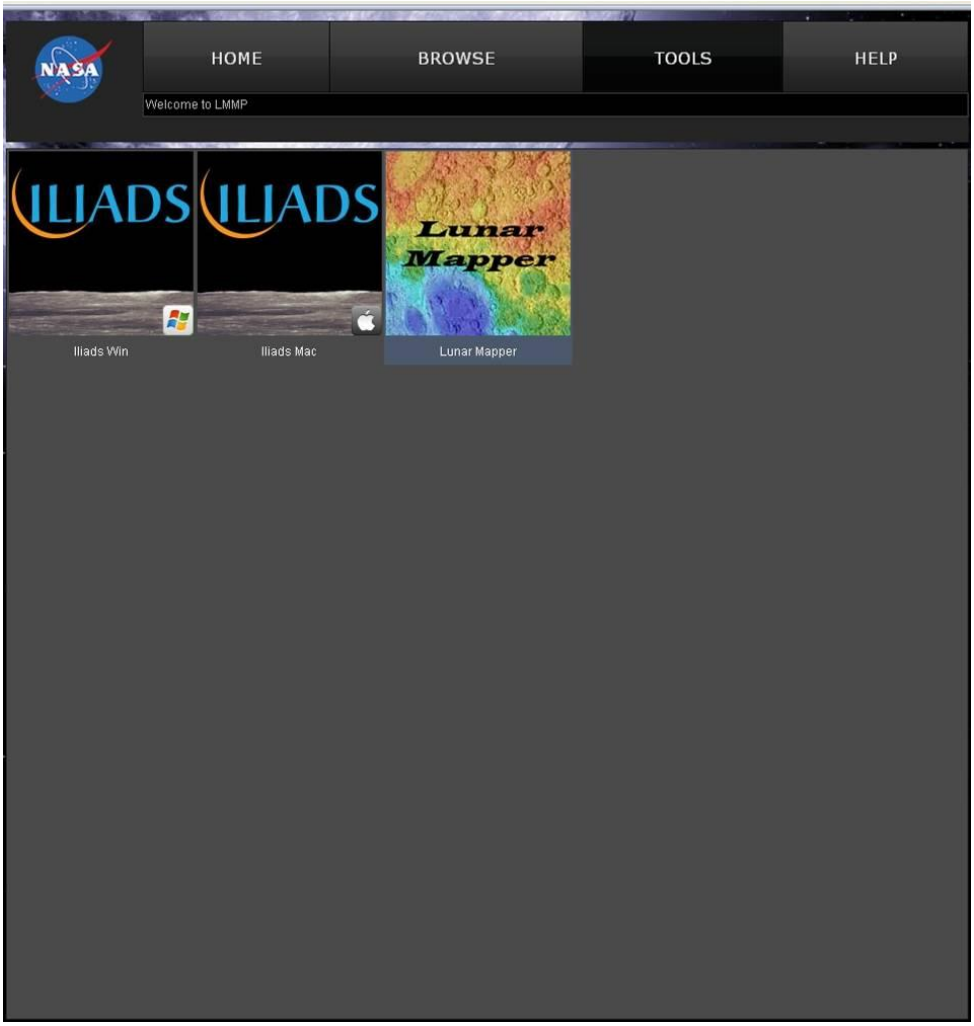

Figure 2.2. Portal TOOLS tab. Start Lunar Mapper by pressing the Lunar Mapper icon.

2.2 Quick tour

Figure 2.3 shows views of Lunar Mapper when it is initially started. Introductory information is provided in the left pane (*Tab Area*) at start-up. The *Tab Area* also provides context-specific information and help, based on what you pick from the *Menu Bar* that runs along the top of the *Map View*. It is also a place where you can enter specific information (for example, a search string or crater name). The name and function of the main parts of the Lunar Mapper interface are also called out in Figures 2.3 and 2.4. A quick summary of each of the parts of the interface follows in the numerical order given in those figures.

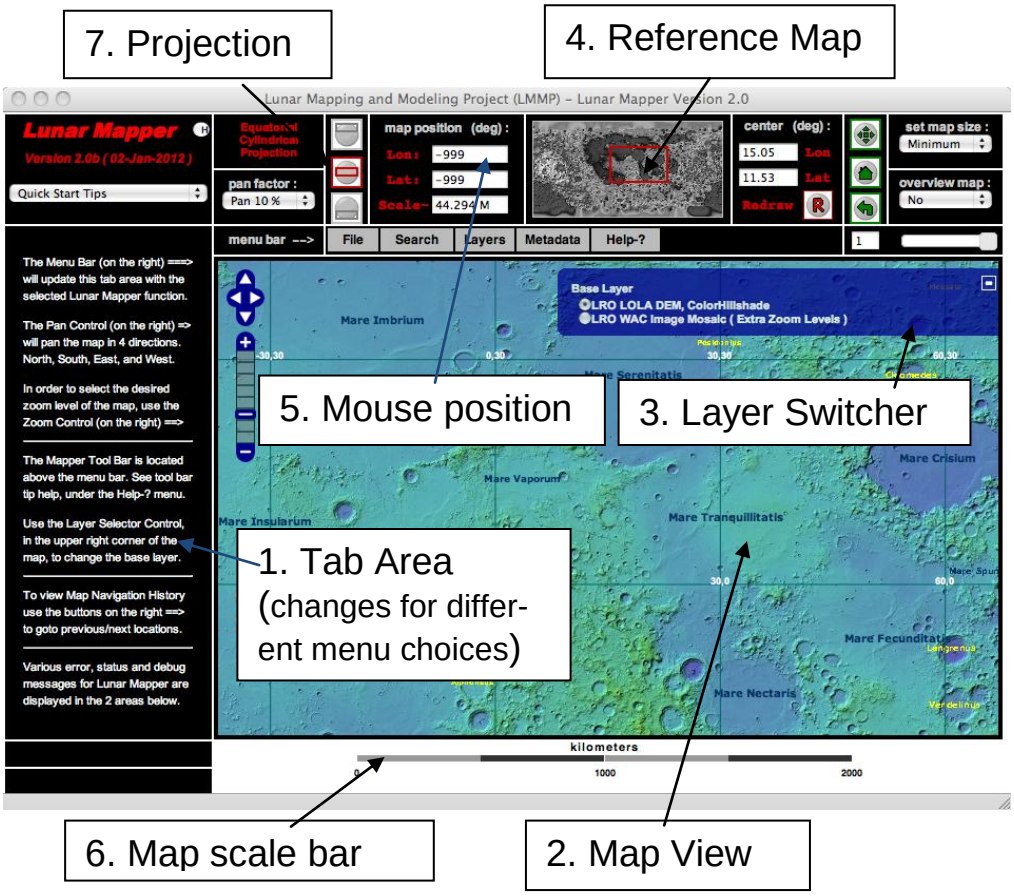

Figure 2.3 Parts of the Lunar Mapper interface.

1. **Tab Area**: This is where context-specific information and dialog boxes are displayed. When Lunar Mapper is opened, this pane briefly introduces you to the interface. The content of this pane changes depending on the menu item chosen in the *Menu Bar*.
2. **Map View**: The center portion of the Lunar Mapper window is the *Map View*. Base layer imagery and any overlays that are turned on are displayed in this pane.
3. **Layer Switcher**: This control allows you to choose which base map images and layers are displayed in the *Map View*. This control can be minimized by clicking the [–] icon in the upper right corner of the *Layer Switcher* and re-opened by clicking the [+] icon.
4. **Reference Map**: This shows where the current map view is zoomed to on the surface of the Moon. In Figure 2.3 the location is shown as a red rectangle giving its extent. As the size of the map view becomes very small by zooming in, cross hairs show you the location.

5. **Mouse position or map position (deg)**: The current position of the mouse cursor over the map view is displayed in degrees latitude and longitude in the upper two dialog boxes. If you mouse over the *Reference Map* and *Overview Map* (which is turned on or off by a yes/no pull-down menu in the upper right), their positions are also displayed here. If the cursor is outside the *Map View*, the position is shown as –999 (out of range). For polar views (picked using the projection control buttons just to the left of map position), the mouse position in meters is shown in the lower left under the *Map View* (in place of the *Map Scale Bar*). The lower dialog box (Scale) displays the approximate scale of the current *Map View*. Scale is a ratio that indicates how many units on the surface of the Moon equals one unit on the map; for example, a scale of 1.9 M tells you that 1 cm on the screen is equal to 1.9 million cm on the Moon. The scale is displayed for information only; you cannot edit it.
6. **Map Scale Bar**: This provides a scale so you can see the spatial extent of the current *Map View*. The *Map Scale Bar* is provided to convey ground distance (units as shown on the screen) as it relates to the scale of the map. There is no *Map Scale Bar* available for the polar projections. So, alternatively, we are displaying mouse position, in meters, for the polar stereographic projections.
7. **Projection**: This gives you the ability to toggle from the equatorial (default) projection of the lunar data to polar projections of the North and South poles.
8. **Map size**: This controls the size of the map on the computer screen. This can be varied from minimum (which fits the minimum required screen size given in section 1) to small, medium, large, and maximum (fills the screen on most monitors).
9. **Overview Map**: This provides a view of the Moon as a globe. It is turned on by choosing “yes” in the *Overview Map* pull-down menu. You can navigate the surface of the Moon by choosing points on the surface of this globe. The globe rotates to center on the selected location, and the *Map View* centers on the location at the current zoom level. The area of the Moon you are viewing in *Map View* is shown on the *Overview Map* with four white registration angles.

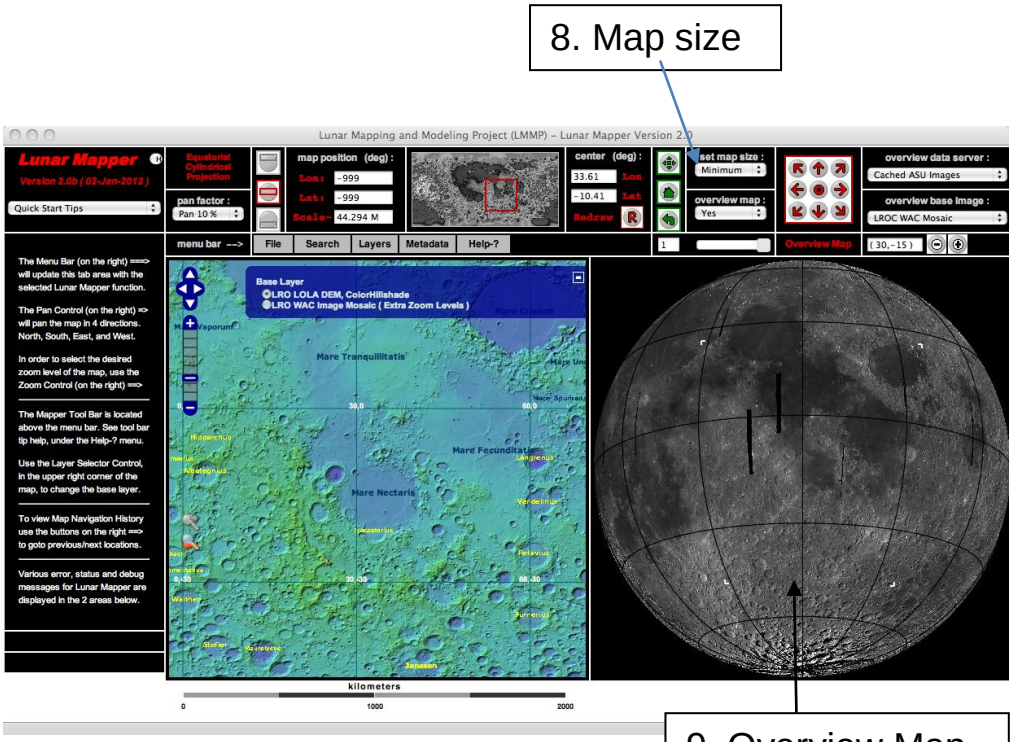

Figure 2.4. Parts of the Lunar Mapper interface when th

Additional discussion about how to use Lunar Mapper is given in the online help (section 3) and in sections 4–9 of this manual.

3 Access to user help

Several levels of user help are available. The lowest level of help is provided via quick help tips that are displayed on the controls as you "hover" over them with the mouse. Also basic help is provided in the Tab Area at start-up. The default pull down menu provides *Quick Start Tips*, *Recent Update Notes*, and *Some Navigation Hints* help.

More detailed help is provided via the *Help-?* choice in the *Menu Bar* (Fig. 3.1). This provides 1) *Map Control Help*, 2) *Toolbar Tip Help* for using the controls in the toolbar that is located at the top of the Lunar Mapper window, 3) *About Lunar Mapper*, which provides copyright information, 4) *Download User Manual,* and 5) *Default Help Display*.

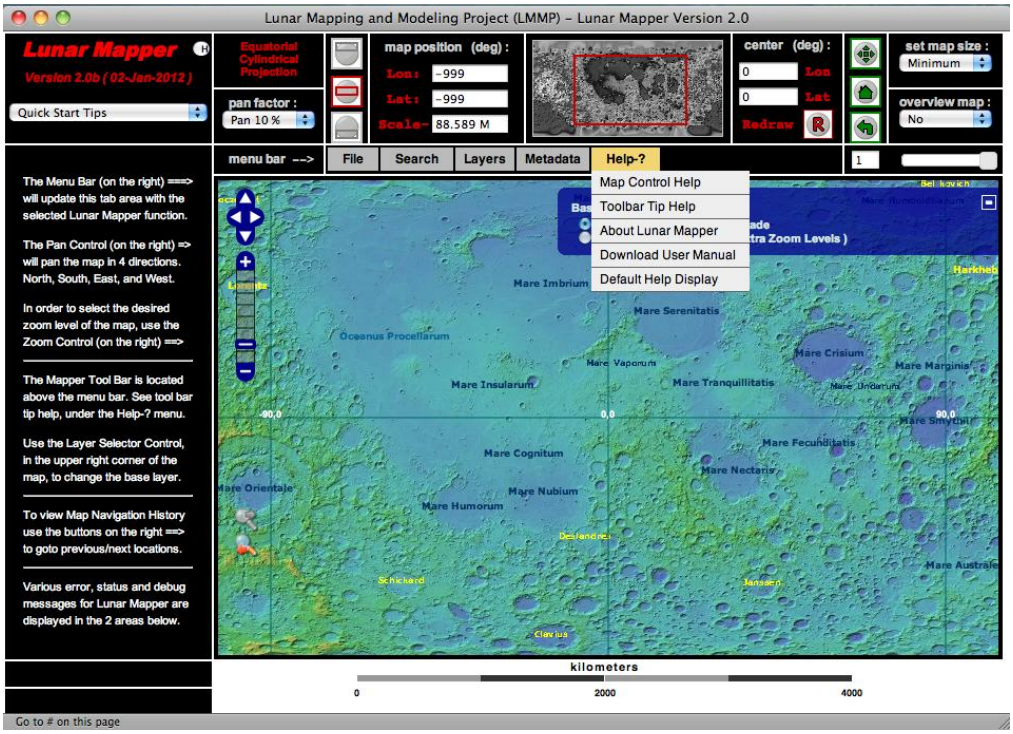

Figure 3.1. Help pull-down menu.

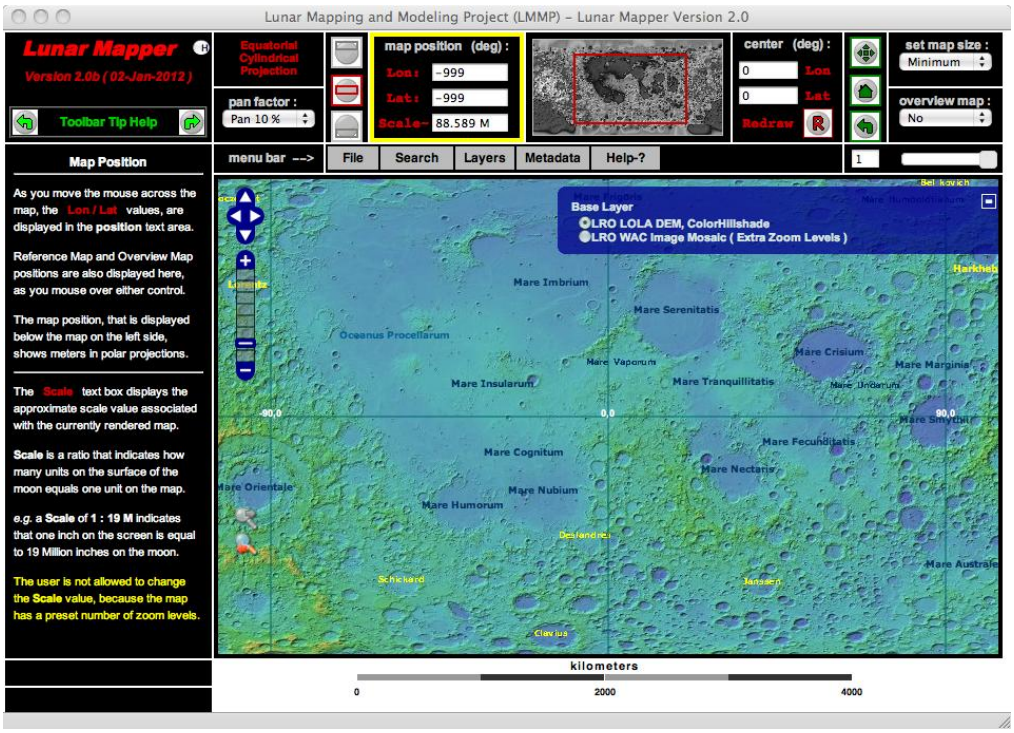

Figure 3.2. Toolbar Tip Help.

Figure 3.2 shows how the *Toolbar Tip Help* works. When the *Toolbar Tip Help* is chosen, arrows appear on the top of the *Tab Area*. Choosing the right arrow advances you to text in the help pane that tells you about the control. It also highlights the location of that control on the screen (e.g. yellow box around the *Reference Map*). Choosing the left arrow goes to the previous control. Again, the control described in the *Tab Area* is highlighted in the toolbar. The *Map Controls Help* works in a similar way.

The *About Lunar Mapper* selection in the help menu displays information about the mapper in the *Tab Area*. If you choose the *Default Help Display* the help displayed in the *Tab Area* at start-up is displayed.

4 Basic Navigation

4.1 Pan

There are several ways to pan around in the *Map View*. The pan factor in the toolbar controls the percentage of the *Map View* that the arrows (Fig. 4.1) will pan in the N, S, E, W directions in the current view. The map pan arrows that are part of the *Overview Map* (Fig. 4.2) will also pan by the chosen percentage. In addition, you can pan by holding the left (or primary) mouse button down and dragging the map image.

You can use the *view history forward* and *view history backward* controls on the lower left of the *Map View* (Fig. 4.3) to go back and forth between recent views.

Figure 4.1. Blue pan arrows.

Figure 4.2. Overview map pan arrows (allows diagonal panning).

Figure 4.3. View History Forward and View History Backward controls.

4.2 Zoom

There are several ways to zoom in on a region in the *Map View*, including picking the + / – symbols on the zoom bar (Fig. 4.4). The number of boxes between the [+] and [–] buttons shows the number of zoom levels available for the displayed *Base Layer*. Click in any of these box-

es to go directly to any zoom level. This is the best way to change zoom levels as it reduces the load on the map server.

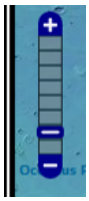

Figure 4.4. Zoom bar (zoom in / out).

You can also zoom by pressing the SHIFT key, and drawing a zoom box in the *Map View* with the mouse. When you use a zoom box to zoom in, the system chooses the closest map zoom level to the size of the zoom box.

To re-center the map at a location and zoom in 2×, double click on the point of interest on the map.

4.3 Goto Buttons

The *Goto Full Extent Button* (top button in Fig. 4.5) sets the map level to the maximum value and centers the map at (0,0), the origin.

The *Goto Initial Extent Button* (center button) resets the map center and scale to when the current map projection was first opened (default view).

The *Goto Prev Extent Button* resets the map center and scale to the values of the previous view.

Figure 4.5. GoTo buttons.

4.4 Search

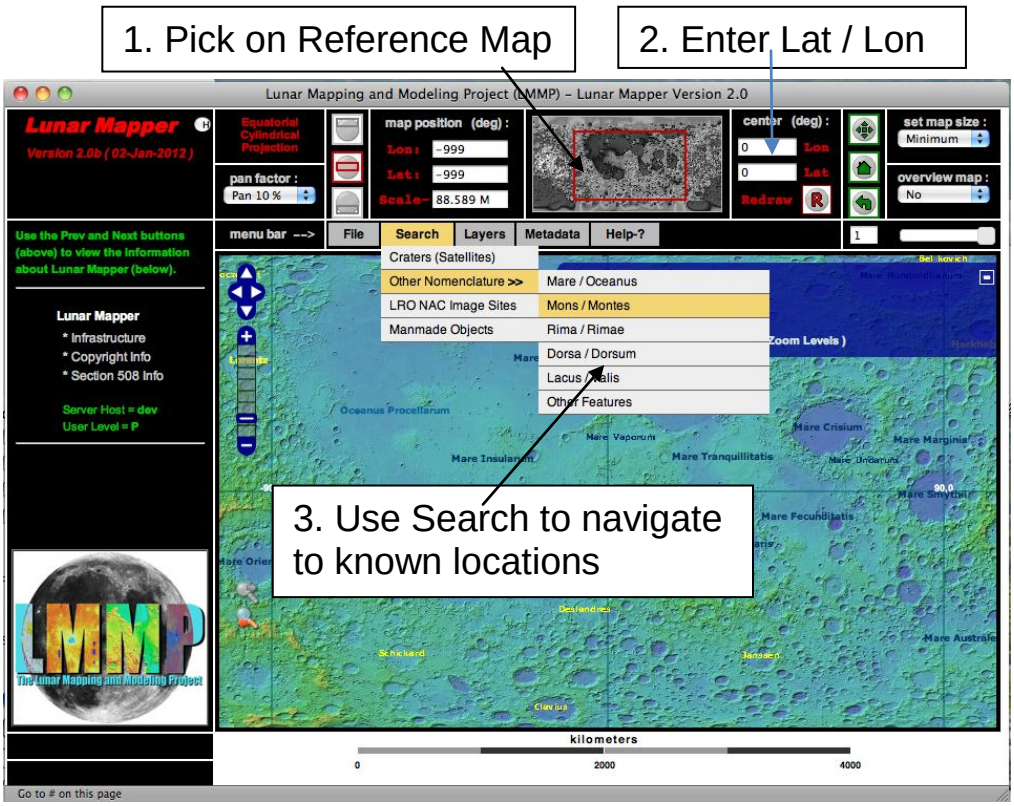

Figure 4.6. Search methods.

There are three ways to search for a site of interest on the lunar surface as shown in Figure 4.6.

4.4.1 Pick a point on the Reference Map (or Overview Map)

The *Reference Map* displays an outline box in red that represents where the current *Map View* is located on a global scale.

The *Reference Map* outline box moves as you pan across the map and the box size changes as you zoom in or out. When the mouse is moved over the *Reference Map*, longitude (*Lon*) and latitude (*Lat*) values are displayed in the map position text boxes. You can move the outline box by clicking anywhere on the *Reference Map*. The *Map View* will change in response to this click, centering it at the new location.

The *Overview Map* works in a similar way and is discussed in more detail in section 4.6.

When the rendered *Map View* is in a polar projection, a 30-degree box is drawn at the appropriate pole in the *Reference Map* window. In this case, the center of the rendered polar map is shown with a red crosshair symbol (no box).

4.4.2 Enter the latitude and longitude of the location in the center dialog box

The map center position *Lon* and *Lat* are updated when the map is panned. However, if you know the exact coordinates where you want to explore, enter the desired center location values into the *Lon* and *Lat* text boxes. Then choose the red **R** redraw button to re-center the map at this new position. Any out of range *Lon* and *Lat* values that are entered bring up a warning dialog box that shows valid ranges for *Lon* and *Lat*. Note: the polar views have limited extent, they do not extend all the way to the equator. So entering coordinates outside the range of the polar Base Map (Latitude less than 60° in the North view or greater than -60° in the South Projection) will not work; you will need to go to equatorial or switch polar views to locate regions outside the displayed projection.

4.4.3 Use the search pull-down menu to navigate to named locations

The *Search* menu allows you to navigate to many named features on the moon surface, such as Craters, Mare, etc. The *Search* drop-down menu provides different search lists when you are using a polar projection versus when you are using the equatorial projection. The polar *Search* menu gives you only *Craters (Satellites)* to choose from, while in the equatorial view, you get several more search options: *Mare / Oceanus; Mons / Montes; Rima / Rimae; Dorsa / Dorsum; Lacus / Valis*; and *Other Features* as shown in Figure 4.7.

Note, when you use the search menu to locate a feature, Lunar Mapper automatically switches to the best available base map imagery in the region of the chosen feature.

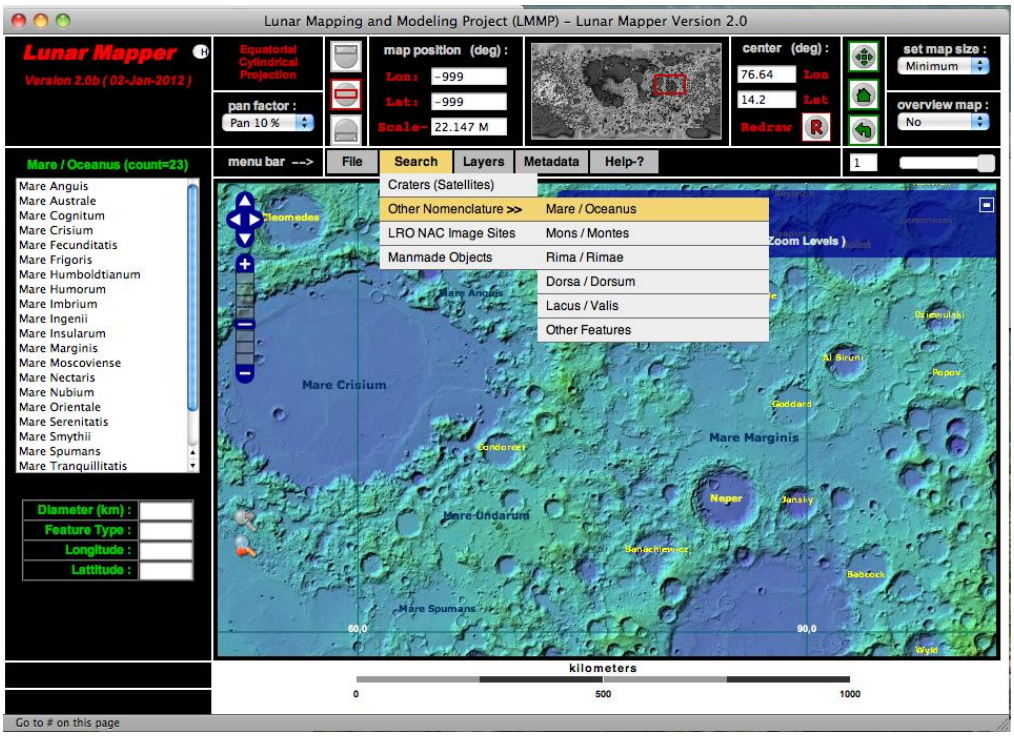

Figure 4.7. List of named Mare under the search menu.

Figures 4.7 and 4.8 show the results of a search for *Mare Nectaris*. First, chose *Mare / Oceanus* under *Other Nomenclature* in the search menu (Fig. 4.7). This creates a list in the *Tab Area* of all named Mare. By choosing *Mare Nectaris* in the list, the map view centers on this mare as shown in Figure 4.8. Additionally, information about the size and location of this feature is displayed in the *Tab Area*. Searching for the other features works in the same way except for *Craters (Satellites)*, described in more detail in section 4.5.

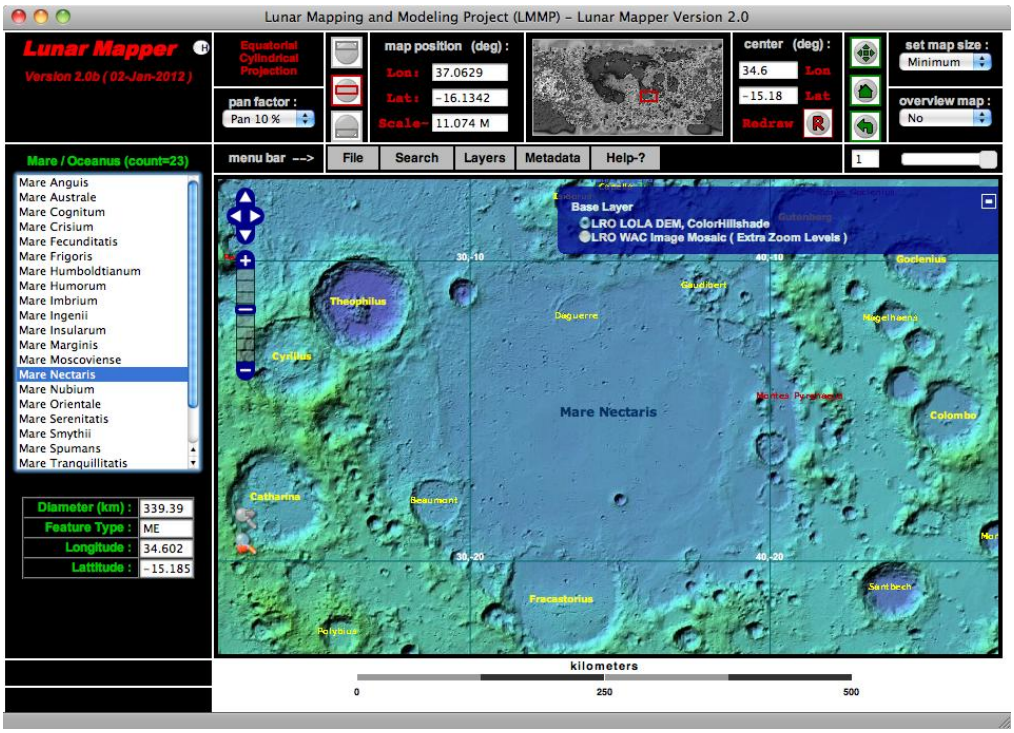

Figure 4.8. Search results for Mare Nectaris**.**

4.5 Crater search

Choosing *Crater (Satellite)* in the *Search* menu (see Fig. 4.7) allows you to locate craters using word completion. For example, you can search for *Tycho* crater by choosing *Crater (Satellite)* in the *Search* menu, then entering “tyc” and pressing the *Search for Craters* button (Fig. 4.9).

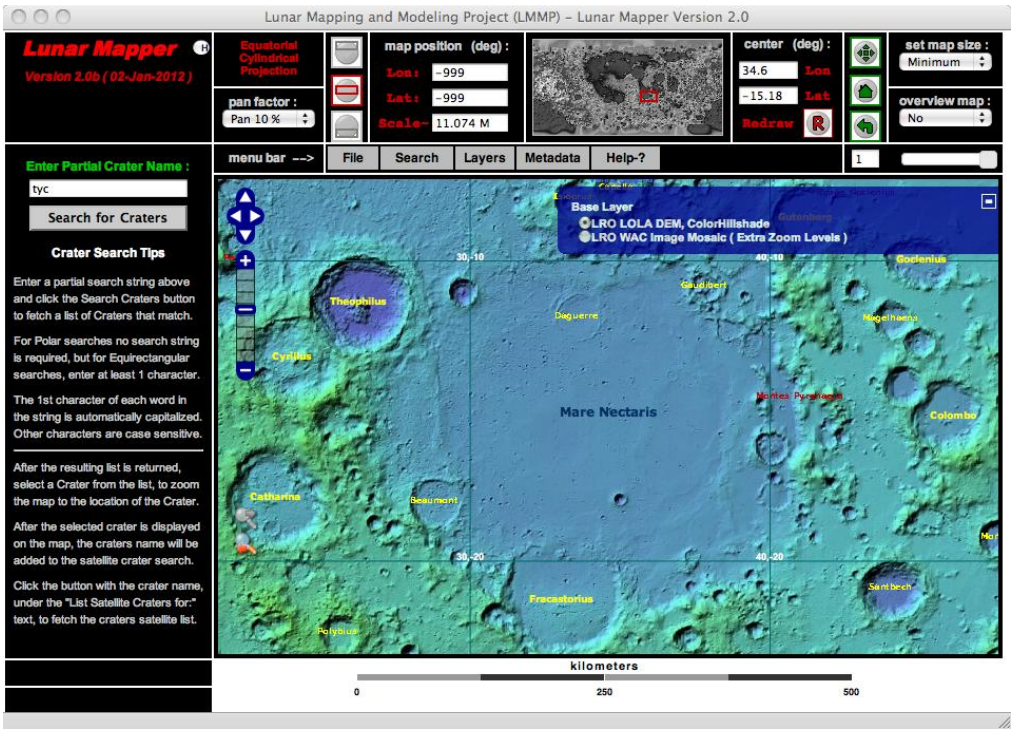

Figure 4.9. Beginning a search for Tycho Crater using "tyc."

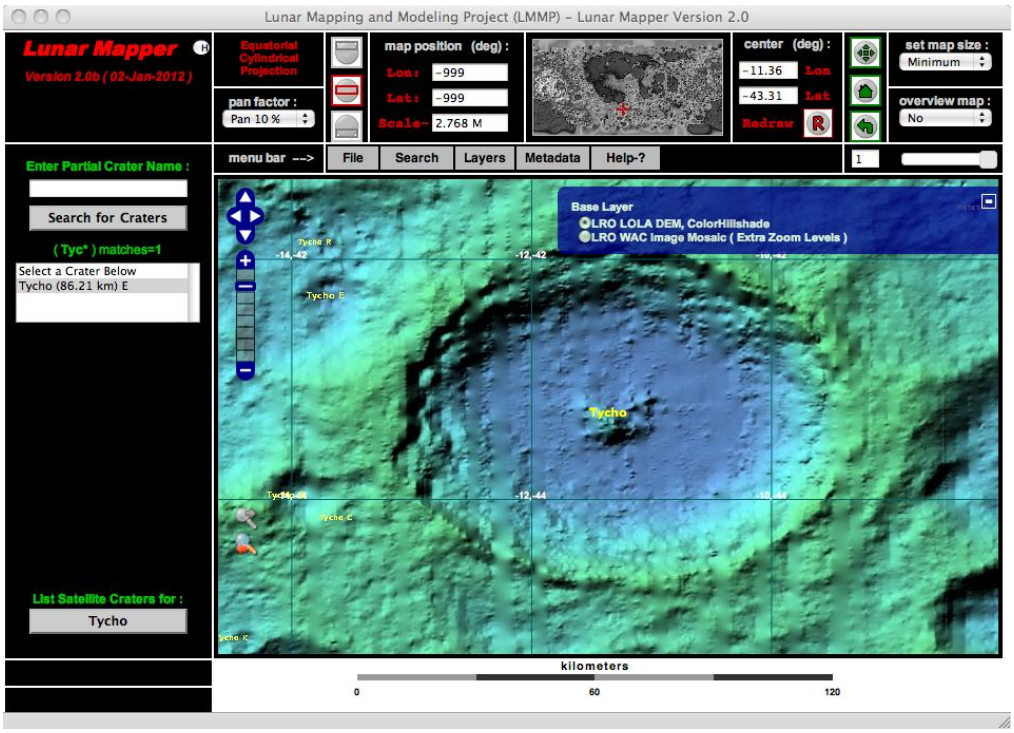

Figure 4.10. Crater search result.

Figure 4.10 shows the results of this search with a list of craters that match the search string. In this case only one crater matches the

search: *Tycho*. Information about its size is given in the list. If you choose *Tycho* in the list, the *Map View* centers on *Tycho* crater (Fig. 4.10).

Also, a list of satellite craters of *Tycho* can be generated by choosing the button at the bottom of the *Tab Area* under *List Satellite Craters for*. The result of the button click is shown in Figure 4.11. A list of the satellite craters for *Tycho* is displayed in the *Tab Area*. Choosing a crater from this new list will center the *Map View* on that crater, as shown in Figure 4.11. *Tycho B* is an example.

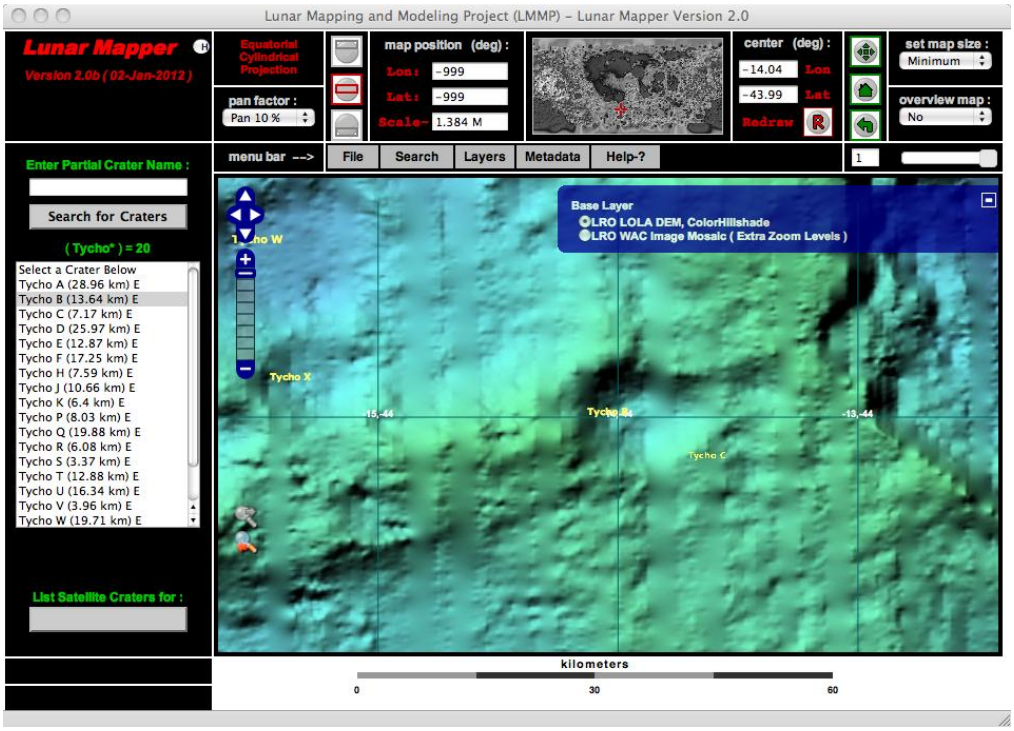

Figure 4.11. Using Search to navigate to the satellite crater Tycho B.

4.6 Overview / preview map

The *Preview* or *Overview Map* can be displayed by toggling the overview map pull-down menu to *Yes* as shown in Figure 4.12. This provides a view of the moon as a globe. The globe can be rotated by clicking on the red arrow buttons above the globe or picking a point on the surface of the globe (*Overview Map*). The *Map View* to the left is updated to the new center location of the globe. As you zoom in, a box that shows the approximate region of the *Map View* is displayed on the *Overview Map* as shown in Fig. 4.12. In this case, the box is outlined with four white corner marks.

Several base maps are available for the overview map. These can be selected by choosing the *overview base image* pull down menu.

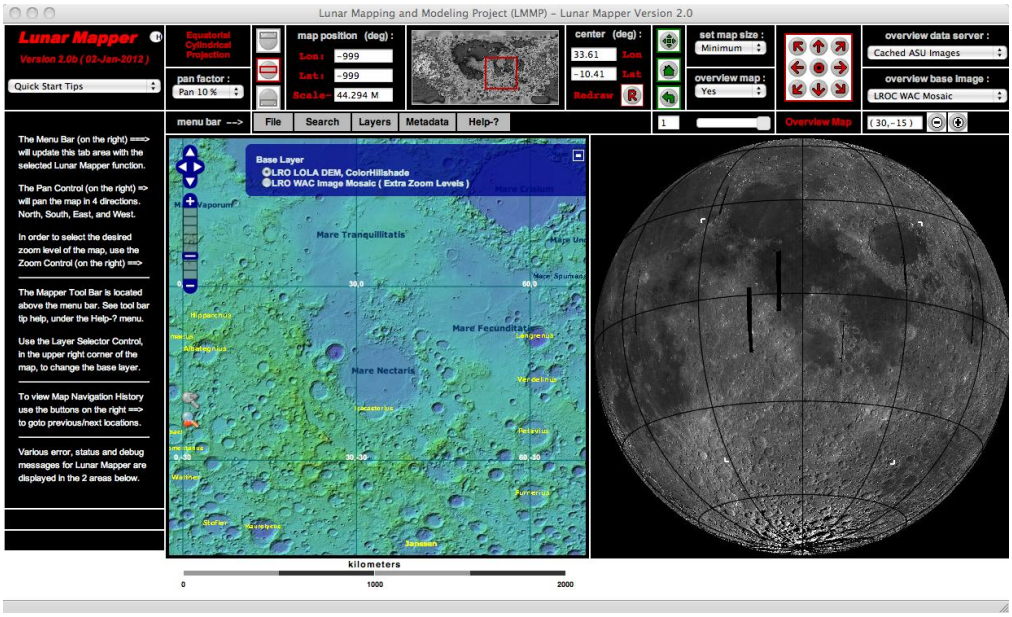

Figure 4.12. Overview or preview map.

You can use the (-) and (+) buttons over the *Overview map* to zoom in and out on the overview map. This provides a preview capability to view the region of interest you are exploring as shown in Figure 4.13.

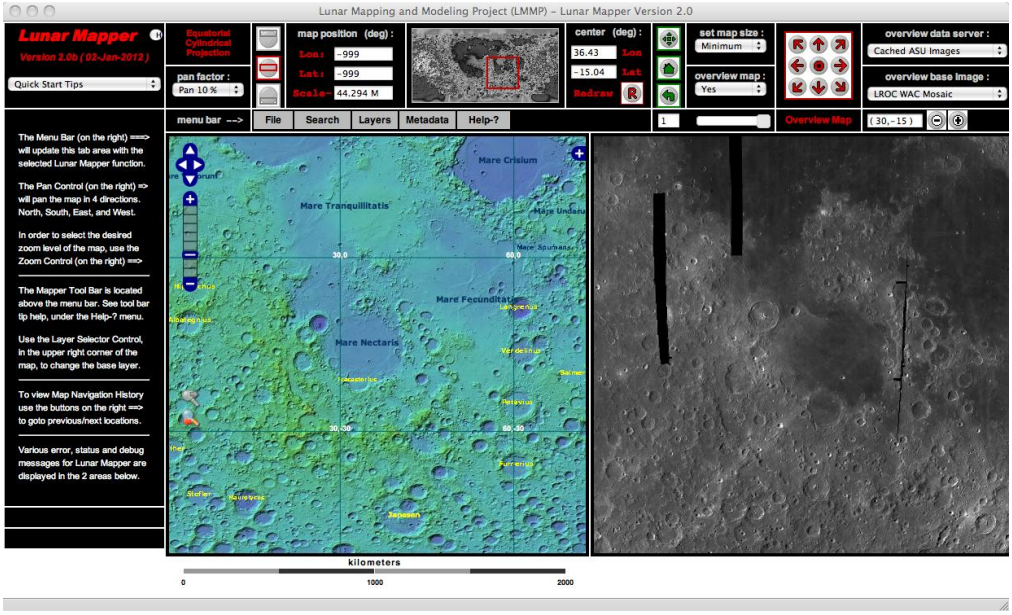

Figure 4.13. Preview map is shown in the right pane of the region displayed in the Map View (left pane).

4.7 Accessibility (Section 508 support)

To provide handicap accessibility, keyboard equivalent actions are provided for many mouse actions as follows.

Keyboard equivalent controls for Pan are:

1. Keyboard arrow keys (small movements, 10%).
2. Home (pan Left), End (pan right), Page up (up), Page down (down) (large movements, 50%).

And for Zoom they are

3. (+) and (-) keyboard keys.

5 Layers

5.1 Map Overlays

Use the *Layer Switcher* control (blue area on the right side of the map) to pick which of the available map layers to display in the map view. Press the minus symbol [–] to hide the *Layer Switcher* from view, and the plus symbol [+] to restore it.

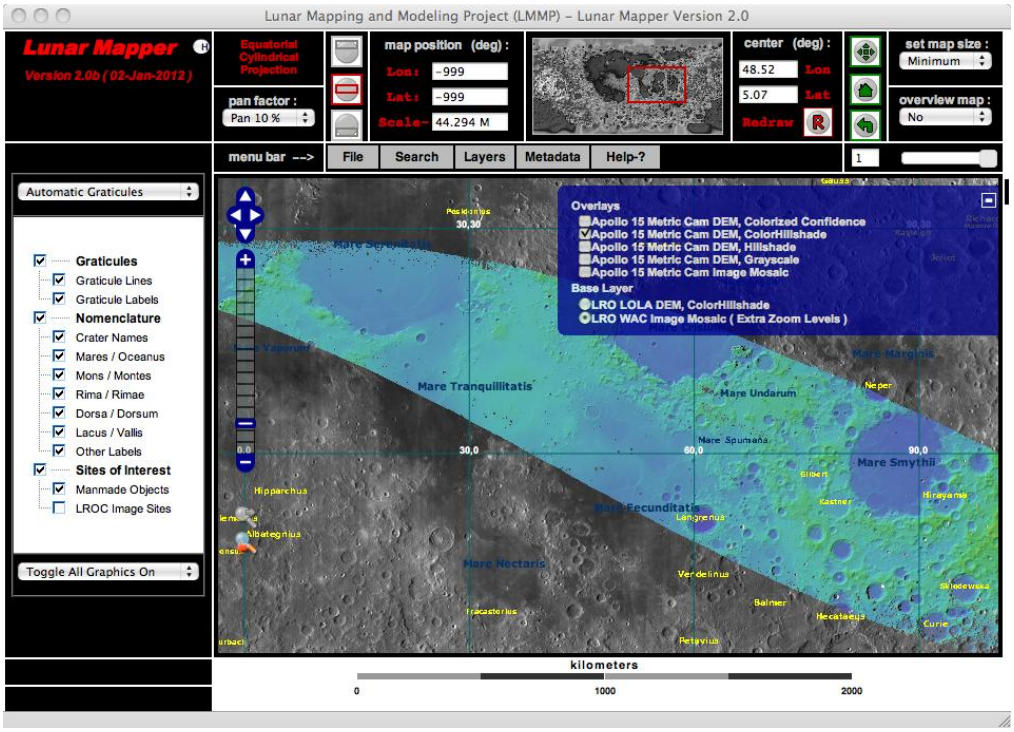

Figure 5.1. Overlays and Base Layers.

There are several types of data (Fig. 5.1) (raster and vector) that are in the following forms:

- Images.
- Topography.
- Nomenclature.

The following sections describe how these data are displayed and manipulated.

5.1.1 Base Layers or maps

Base map images are available to provide a *Base Layer* over which other data can be draped (overlaid). The loaded *Base Layers* for the chosen map projection are listed in the *Layer Switcher* menu. Figure 5.2 shows the default *Base Layers* loaded for the equatorial view when Lunar Mapper is opened. Additional Base Layers can be loaded using the *Layers* > *Add Base Layers* menu.

Only one *Base Layer* can be displayed at a time in the *Map View*. To display a *Base Layer*, choose the radio button to the left of that layer.

Each map *Base Layer* may have a different number of zoom levels (their map scales may not align). When you choose a new *Base Layer*, the closest zoom level to that of the prior *Base Layer* is automatically displayed.

When you are doing various searches, the *Base Layer* may be automatically changed to display the best image for that region.

5.1.2 Overlays

Available raster layers are listed under the *Layers* > *Add Overlay Group* menu. These can be draped over the chosen *Base layer*. Choosing a layer group will add that group to the *Layer Switcher*.

5.1.3 Controlling Graphics Overlays and Nomenclature display

Vector layers available for the current *Map Projection* that can be draped over the base map are controlled via *Layers* > *Toggle Map Graphics*. These include graphical features (*Graticules*), *Nomenclature*, and *Sites of Interest*. The *Tab Area* in Figure 5.1 shows the menu displayed when *Toggle Map Graphics* is chosen. You can turn on any or all of these overlays at the same time by picking the check box to the left of the item.

5.1.4 Graticules

These are horizontal and vertical lines displayed in the *Map View* to indicate *Lon* and *Lat* in degrees. As shown in Figure 5.1, the lines or labels can be toggled on or off by picking the check boxes on the left side of the *Tab Area*. For *Automatic Graticules* (default) the spacing of

the *Graticules* scale with the *Map View*; the more you zoom in, the more closely spaced the *Graticules* are (e.g., at a map scale of 2.8 M, the *Graticule* spacing is 2 degrees, while at a scale of 11 M, the *Graticule* spacing is 10 degrees).

The pull-down menu a the top of the *Toggle Graphic Layers* menu displayed in the *Tab Area* allows manual control of the spacing of the graticules, from 1 to 90 degrees, provided the current *Map View* supports the spacing selected. For example, choosing a close spacing (e.g., 1 degree) at a large map scale such as 44M would put too many graticules on the *Map View* and obscure the displayed map. To avoid this Lunar Mapper limits the graticule spacing so there are no more than 12 spaced across the *Map View*. Choosing a spacing that would exceed this number will produce a warning, and Lunar Mapper will revert to rendering *Automatic Graticules*.

5.1.5 Nomenclature

The standard nomenclature for features on the Moon is available as one data layer. This includes names for Craters, Mare, Rima, etc. The labeling of features in the *Map View* is controlled by the map scale, with large scale features being labeled when zoomed to full extent; the labels for smaller scale features turn on as you zoom in closer. The color of the labels depends on the feature type (for example, Mare in blue and craters in yellow). However, you can toggle on and off the nomenclature for individual feature types (e.g., Mare) using the *Toggle Graphic Layers* control.

5.1.6 Selecting base layers and overlays

The order and transparency of a highlighted or selected layer can be controlled. Also selected layers can be removed from the *Layer Switcher* list. *Base Layers* and *Overlays* can be selected by picking the layer title in the *Layer Switcher* menu. This will turn the text red (see Fig. 5.2 for a look at how the title turns red). By choosing the title again, the layer is deselected (returns to white text).

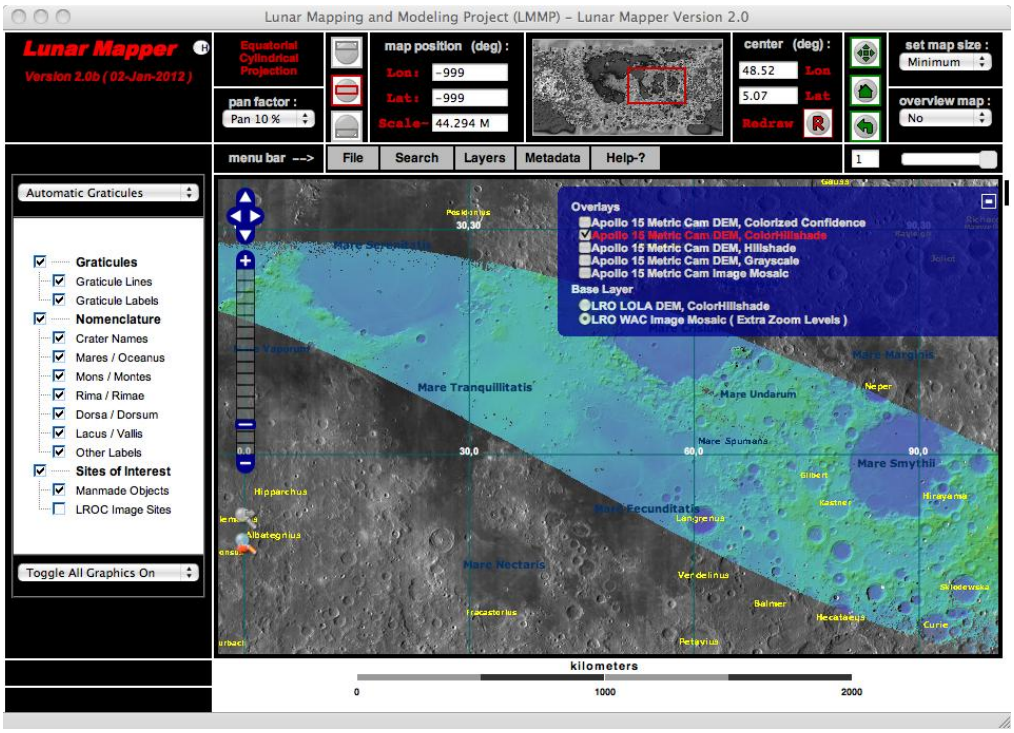

Figure 5.2. Demonstrating layer selection.

5.1.7 Layer ordering: controlling what layers appear on top

Ordering of the overlays is particularly useful as the layers that are highest in the list are displayed on top of the other layers. The order that both *Base Layers* and *Overlays* appear in the *Layer Switcher* can be changed using the *Layers* > *Layer Positioning* option. A highlighted *Overlay* or *Base Layer* can be moved up and down in the list. Only one layer can be moved up or down at a time, so only one layer should be selected when attempting to ordering layers.

5.1.8 Layer transparency

The transparency of the *Overlays* can be controlled with the slider control on the right edge of the menu bar. The opacity of the highlighted layer can be changed from 0 to 1 (0 to 100%), as indicated by the text box to the left of the slider control. Layers that have been turned off (un-checked) retain their transparency / opacity setting.

You cannot change the transparency of *Base Layers*.

5.1.9 Removing and Restoring Layers

Base Layers and *Overlays* can be removed from the *Layer Switcher* list by using *Layer* > *Layer Removal* option. This provides several methods for removing *Base Layers* and *Overlays* from the *Layer Switcher*:

- Remove all Overlays
- Remove Local Site Overlays
- Remove Global Overlays
- Remove Selected Layers (red)
- Keep Visible Layers Only (checked)

These layers are not permanently removed, but are just removed from the *Layer Switcher* list. *Base Layers* can all be restored at any time via *Layers* > *Add Base Layers*. Overlays can be restored by adding back the group using *Layers* > *Add Overlay Group*.

5.2 Map Legends

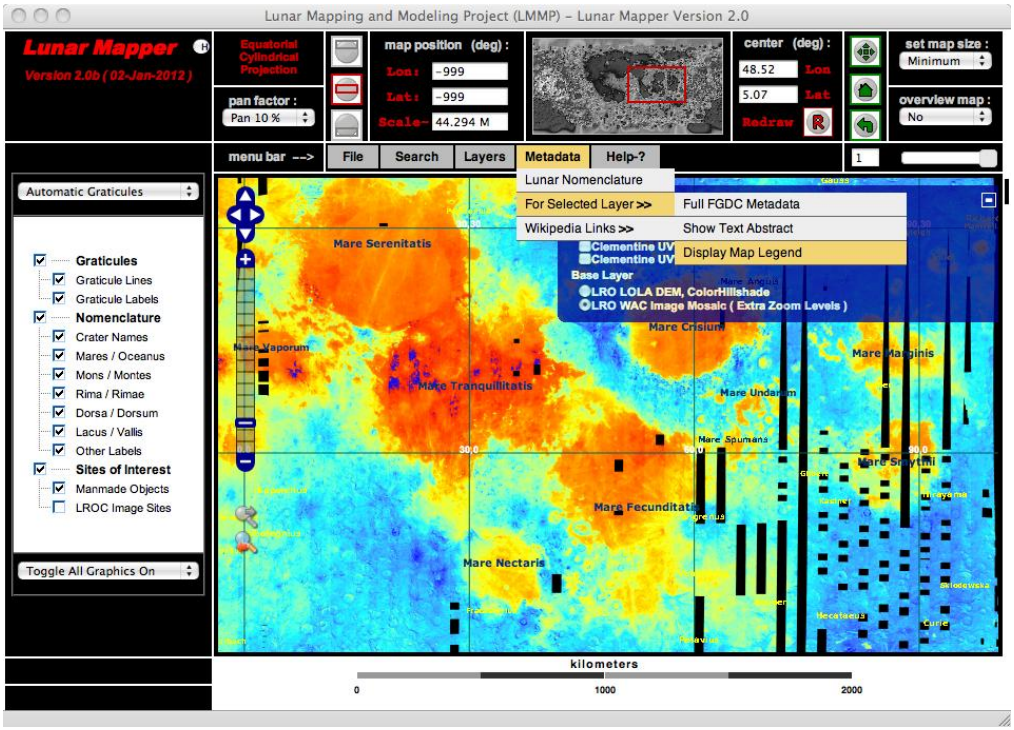

Figure 5.3. Accessing Map Legends.

Legends are provided for *Base Layers* and *Overlays* as appropriate such as layers showing mineralogy or elevation data. To display a *Map Legend* for the selected layer (layer highlighted red), pick *Metadata* > *For Selected Layer* >> *Display Map Legend* (Fig 5.3). The legend for the selected layer will be displayed, for example the legend for the Clementine UVVIS FeO Weight-Percent layer (Fig. 5.3) is shown in Figure 5.4. When a legend is not available for the chosen layer, a blank web window is displayed.

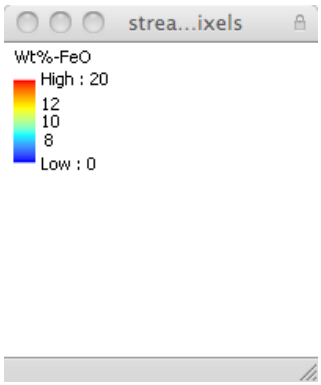

Figure 5.4. Legend displayed for LRO Colorized and Shaded Elevation Base Layer.

5.3 Map Annotations

Using *Layers* > *Edit Map Annotations*, you can draw on the *Map View* and measure the properties (distance and area) of features on the lunar surface (Fig. 5.5). *Points*, *Lines,* and *Polygons* can be added to the map view. Once geometries are drawn on the *Map View,* you can determine the properties of the feature using *Measure Geometry*. After a geometry is added to the view, it can be modified with the following operations: *Drag* (move), *Rotate*, *Reshape*, *Resize,* and *Remove*.

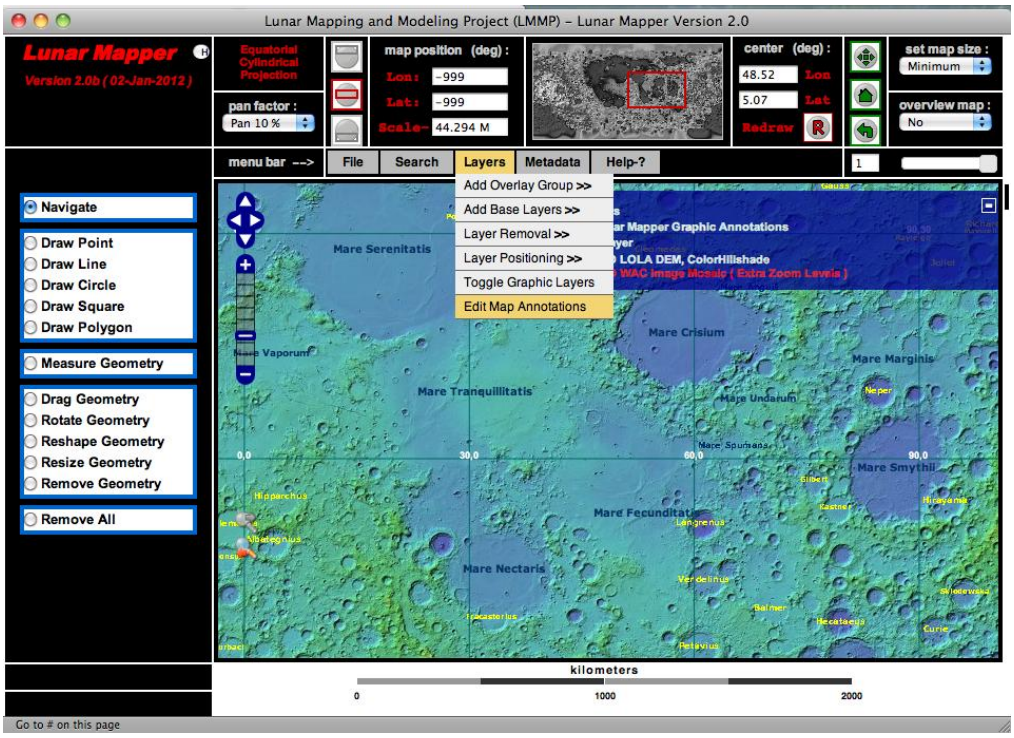

Figure 5.5. Edit map annotations.

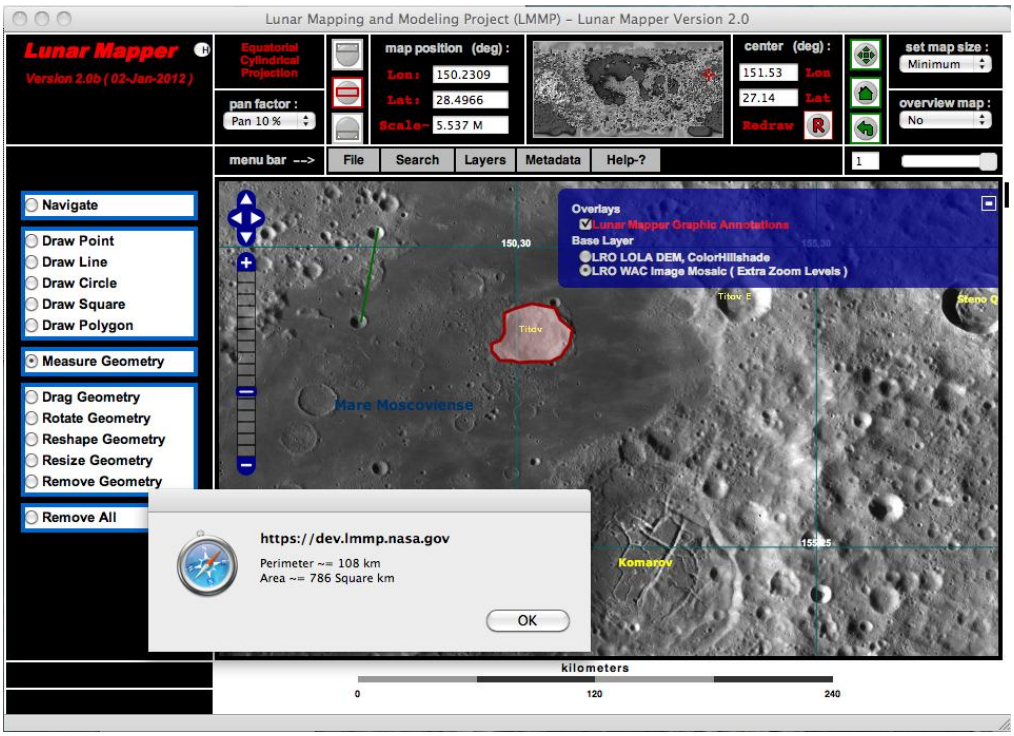

Figure 5.6. Examples of Map Annotations and measurements that can be made using the Measure Geometry tool.

These annotations can be used to indicate:

- Points of interest (points do not scale with zoom level while other objects do).
- Rover path.
- Highlight features.

And they support:

- Mission planning.
- Science.

To use any of the tools, you first click on a spot on the *Map View*. Then for a circle, you just drag the point and the circle grows. For a polygon, you click on a spot on the *Map View* and then click on another spot. You then continue to pick points to create a shape. You stop the drawing of the polygon by double clicking. You draw a line by picking points. Lines connect the points; double clicking ends the line. Figure 5.12 shows both a circle and a polygon drawn in the *Map View*.

The annotations remain on the map view as long as your current Lunar Mapper session is open, and you remain in the same map projection. Closing Lunar Mapper or changing map projections will erase the *Map Annotations*.

5.4 Metadata

Metadata is information about the data available in Lunar Mapper that can be viewed via the *Metadata* menu option. *Metadata* are available for the *Nomenclature*, *Base Layers* and *Overlays*. Also under the *Metadata* menu are useful links to *Wikipedia* that provide background information on lunar exploration and the sources of the data presented in Lunar Mapper.

Metadata for a selected layer (layer highlighted red in *Layer Switcher*) is displayed in a separate web page by choosing the *Metadata > For Selected Layer* option. An example web page that is displayed for choosing the *Full FGDC Metadata* option is shown in Figure 5.7. An abstract of the metadata can also be displayed by choosing the *Show Text Abstract* option.

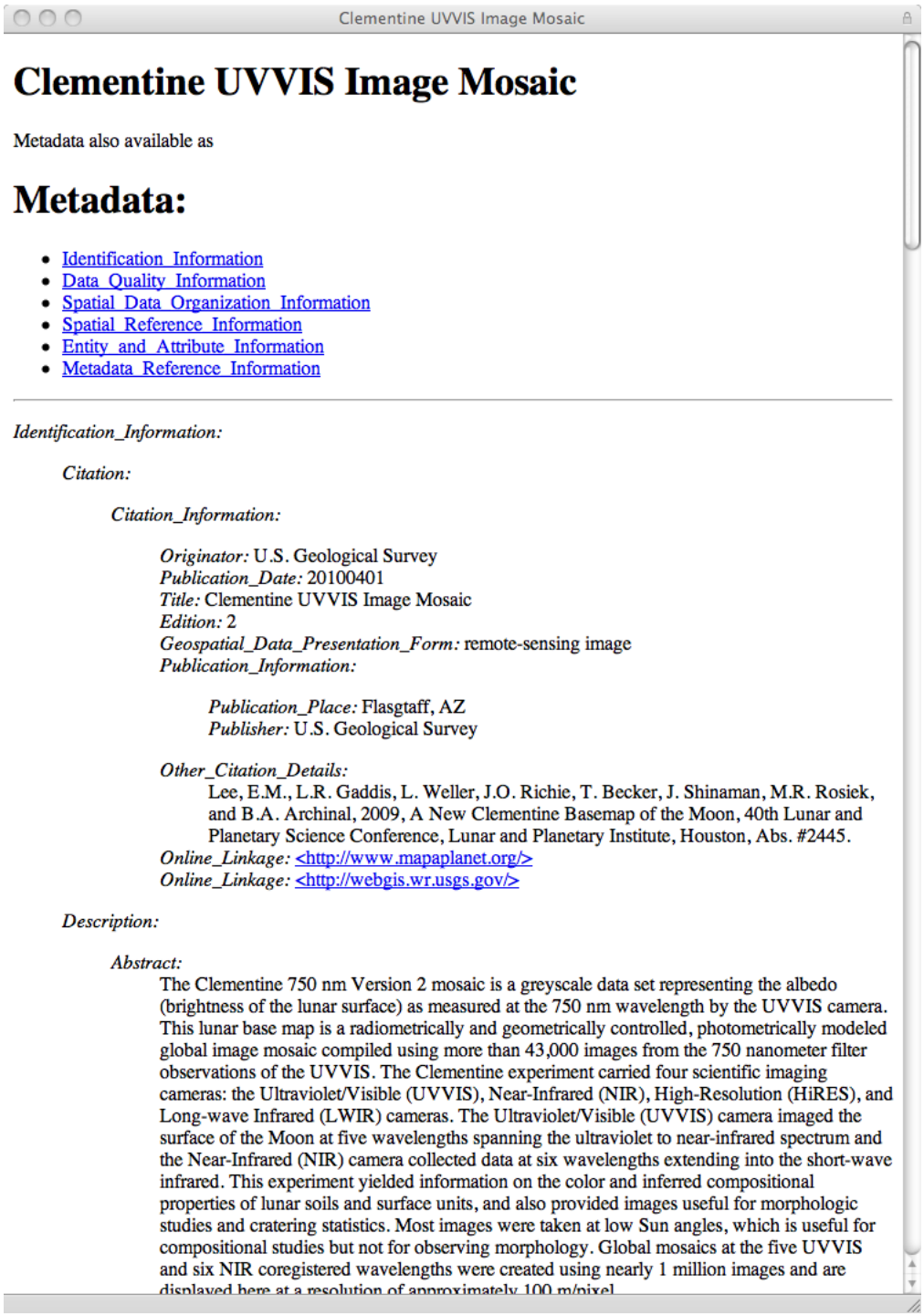

Figure 5.7. Screen shot of metadata window for Clementine Image Mosaic Base Layer. This is the result from selecting the Full FGDC Metadata option.

6 Map Views and Printing

6.1 Saving and loading Map views

The settings for a current view of the *Map View* can be saved for future viewing. This includes

- Current View.
- Current base map.
- Visible Overlays, including ordering and transparency.

This is done using the *File* > *Map Views* menu option. Figure 6.1 shows the *Map View* memory area. The controls on the memory area allow saving to [*ms*] and recalling [*mr*] *Map Views* from the memory area. You can save up to ten *Map Views* at a time. A memory area can be cleared using the [*mc*] button for that area.

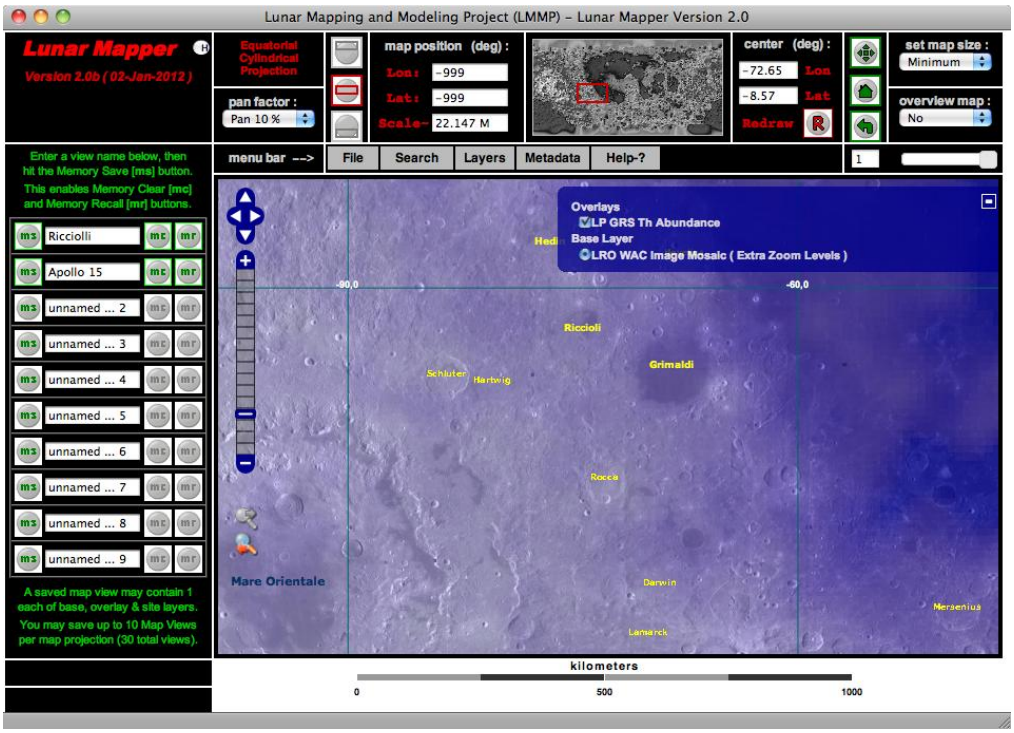

Figure 6.1. Save Map View menu. Two views are saved in memory locations 0 and 1. The remaining memory locations are vacant.

The saved views are kept between Lunar Mapper sessions, so the *Map Views* can be recalled after Lunar Mapper has been closed and re-

opened, provided your browsers cookies have not been cleared or removed.

6.2 Map Print Layout and Printing

The Map View can be displayed in a format suitable for printing using the *File* > *Print Map Layout* menu option. The layout can be formatted for either portrait or landscape printing. Everything in the *Map View* except for map annotations can be viewed in the print layout, including the visible layers with associated transparency and map legends if applicable.

6.2.1 Controlling Print Layout

Though any *Map View* can be printed using the print capabilities in Lunar Mapper, by using the *Printing* option in the *set map size* tool located in the upper right of the *Tool Bar*, the proportions of the *Map View* are made compatible with the final print layout (i.e., none of the *Map View* is cropped to fit in the print layout). Therefore, to create a Map View it is recommended that you first enable the *Printing* option in the *set map size* tool. Then position within the Map View the region that you want to be included in the print layout, by panning and zooming. Also, turning desired *Base Layers* and *Overlays*, with the desired transparency settings as shown in Figure 6.2. The Map View can then be viewed in the print layout using the *File* > *Print Map Layout* option. As shown in Figure 6.3 the print layout includes the *Legends* for the *Base Layer* and *Overlays,* a summary of the data source, reference map, the version of Lunar Mapper used, date and time the Layout was generated and places for the user to enter their name and organization. Other descriptive data can be added to the layout in the text boxes over the top of the *Map View* image in the *Print Layout*. In this case additional descriptive data was added to the left and right text boxes, while the default text in the middle text box was left unchanged.

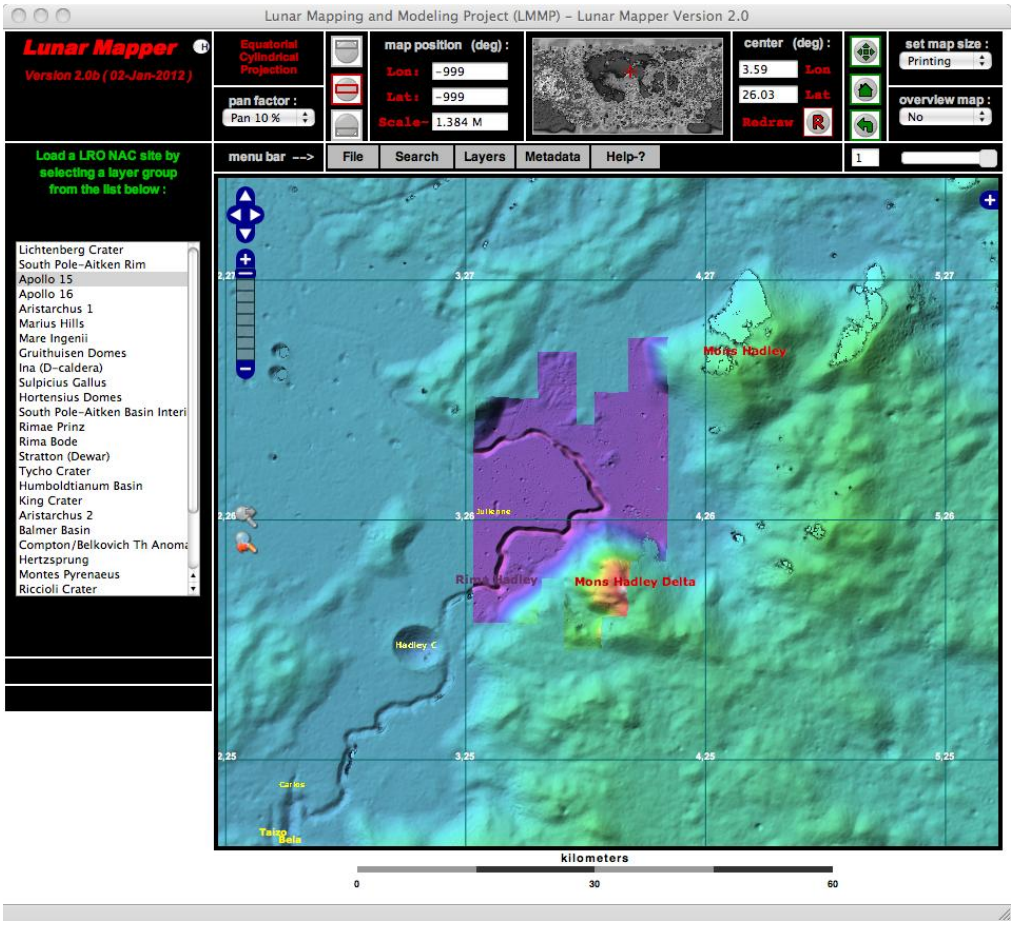

Figure 6.2. Map View set to Printing map size for layout of a print view.

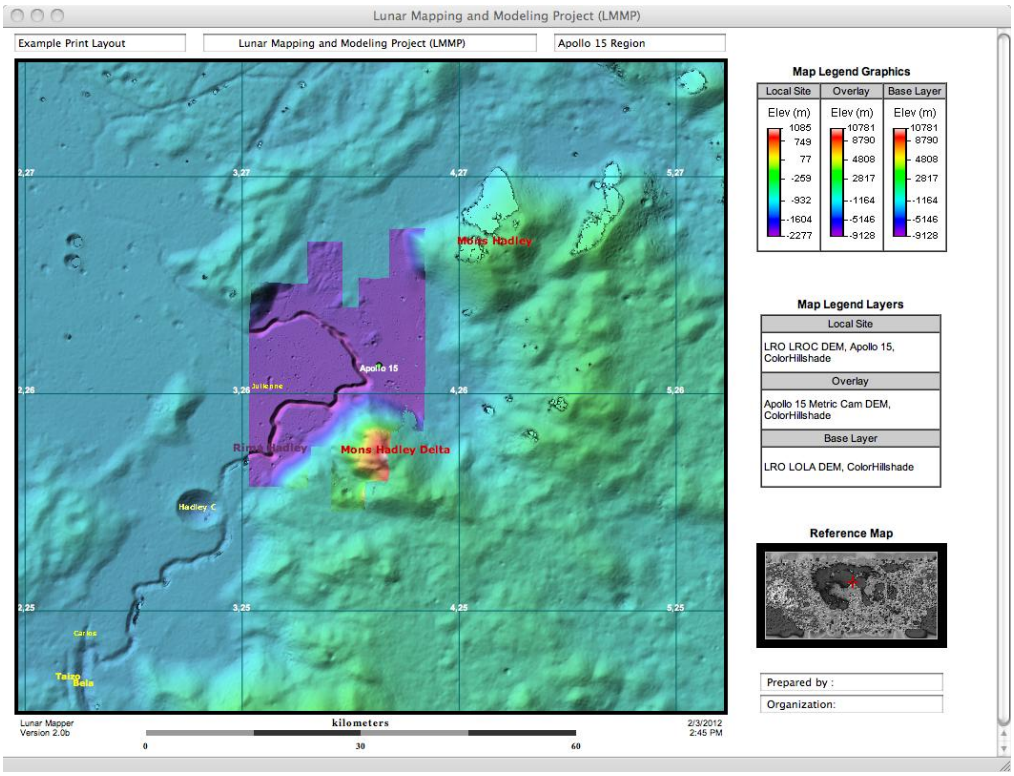

Figure 6.3. Print Layout in landscape orientation of the Map View shown in Figure 6.2.

6.3 Saving Images of Map Views

In addition to printing a hard copy of the *Map View* it may be desirable to create an image file of the *Map View*, *Print Layout*, or the entire Lunar Mapper window. Lunar Mapper does not provide specific capability to generate such images, but using tools distributed with the Operating system this can be done quite easily.

6.3.1 MS Windows

In Windows XP or 7 the “Prnt Scrn” function key will copy the contents of the display to the clipboard. Then open the “Paint” program, distributed with Windows, and press the Paste (clipboard) button in the Paint window. This copies the contents of the clipboard into Paint. This image can then be cropped to include an entire Print Layout, the Lunar Mapper window or portions of the Lunar Mapper interface. The image can be saved using Paint in .bmp (bitmap) format.

Though other programs are available to provide this same functionality, the above procedure takes advantage of utilities distributed with the operating system.

6.3.2 Mac OS 10.x

The “Grab” utility distributed with OS 10.X can also be used. After starting Grab, choose the “Capture” option on the Mac menu bar and select the “Window” choice. A dialog box will appear, pick “Choose Window” then click within the window that you want the image created of, either the *Print Layout* window, or Lunar Mapper. This copies the contents of the window to a new window. To save the image use the *File* > *Save* option in Grab. This allows you to save a .tiff (Tagged Image File Format) image of the selected window.

A *Print Layout* can also be saved directly to a .pdf (Portable Document Format) file in Mac OS 10.x using the *File* > *Print* option in the browser. Once the print window opens choose the orientation (portrait or landscape) consistent with the *Print Layout* created by Lunar Mapper. Also, uncheck “Print headers and footers.” Then choose the “PDF” drop down menu in the lower left of the print window and select “Save as PDF ...” This will save a .pdf document that fits on a single page.

7 Reserved section

This section is reserved for functionality associated with the restricted version of Lunar Mapper.

8 Tutorial

8.1 Apollo 15—Hadley Rille

This tutorial will demonstrate how the Lunar Mapper tools can be used to help you explore the Moon. In this tutorial, we will use *Map Annotations* to trace a feature (a portion of Hadley Rille) that is visible on a high resolution data layer so that its path can be seen clearly on a lower resolution data layer. You will start by navigating to Mons Hadley (Hadley Mountain).

- Turn on *Base Layer* > *LRO LOLA DEM, ColorHillshade*.
- Chose: *Search* > *Other Nomenclature* > *Mons / Montes* from the *Menu Bar* (*Fig. 8.1*).
- Chose: Mons Hadley Delta from the list on in the *Tab Area*.

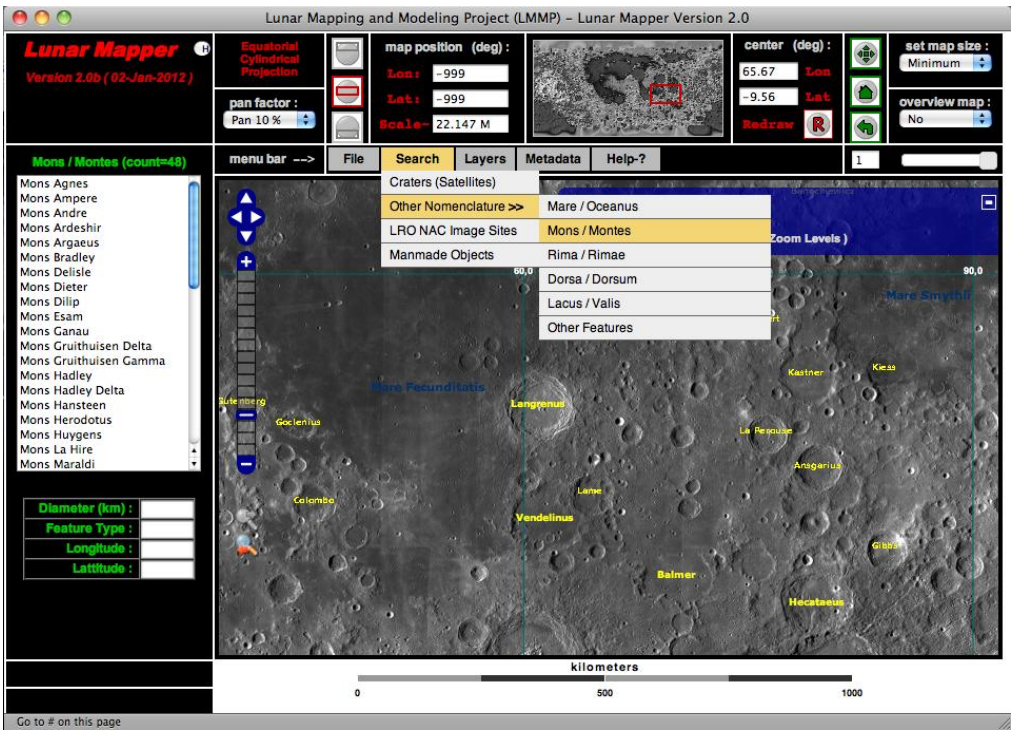

Figure 8.1. Finding Mons Hadley Delta.

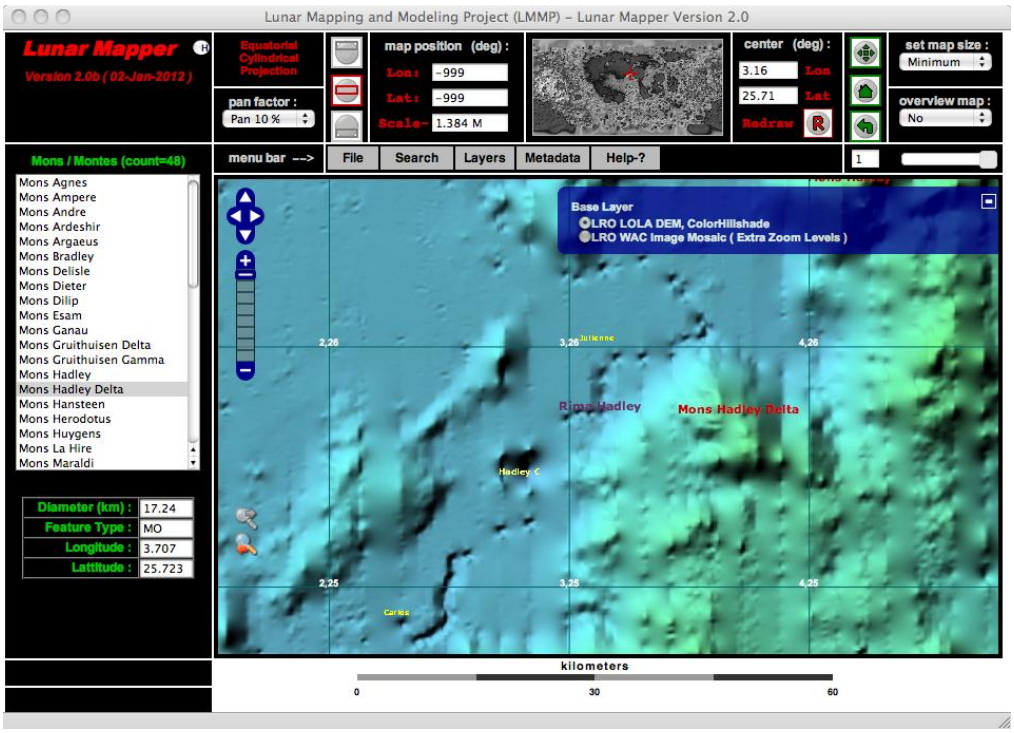

Figure 8.2. Mons Hadley Delta region.

Figure 8.2 shows the result of this search. However, the Hadley Rille feature does not show up well on this color shaded base map, so, we will highlight the Rille on the image.

This can be done by turning on *Apollo 15 Metric Cam Image Mosaic* overlay that shows the Hadley Rille feature clearly (sinuous feature in the center of the Map View, Fig. 8.3). To do this the layer needs to be loaded:

- Add the Apollo 15 Group to the Layer selector by choosing *Layers* > *Add Overlay Group* >> *Add Apollo 15 Group*
- Turn on the *Apollo 15 Metric Cam Image Mosaic* overlay by choosing it in the *Layer Switcher*.

Now the Hadley Rille can be traced as follows.

- Choose: *Layers* > *Edit Map Annotations*.
- Choose: *Draw Line*.
- Draw a line that follows the Hadley Rille feature as shown in Figure 8.3.

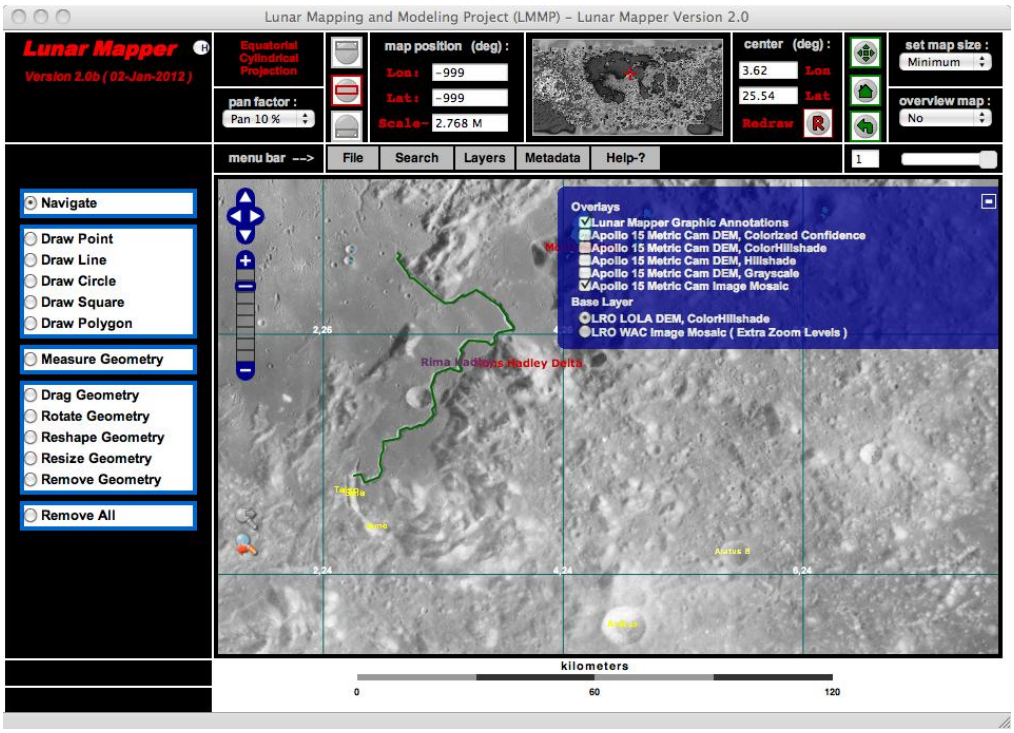

Figure 8.3. Line highlighting a portion of the Hadley Rille feature.

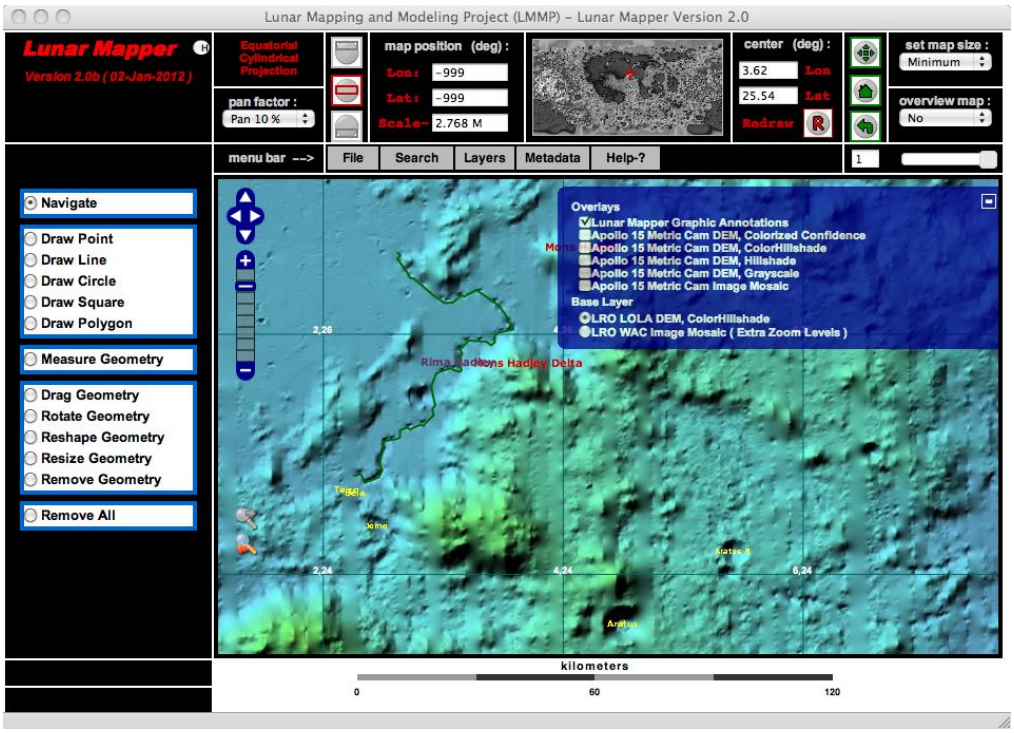

Figure 8.4. LRO LOLA DEM, ColorHillshade with the Hadley Rille highlighted.

Turn off the *Apollo 15 Metric Cam Image Mosaic*. The outline of Hadley Rille is now overlaid on the *Base Layer LRO Colorized and Shaded Elevation* map (Fig. 8.4).

8.2 Explore

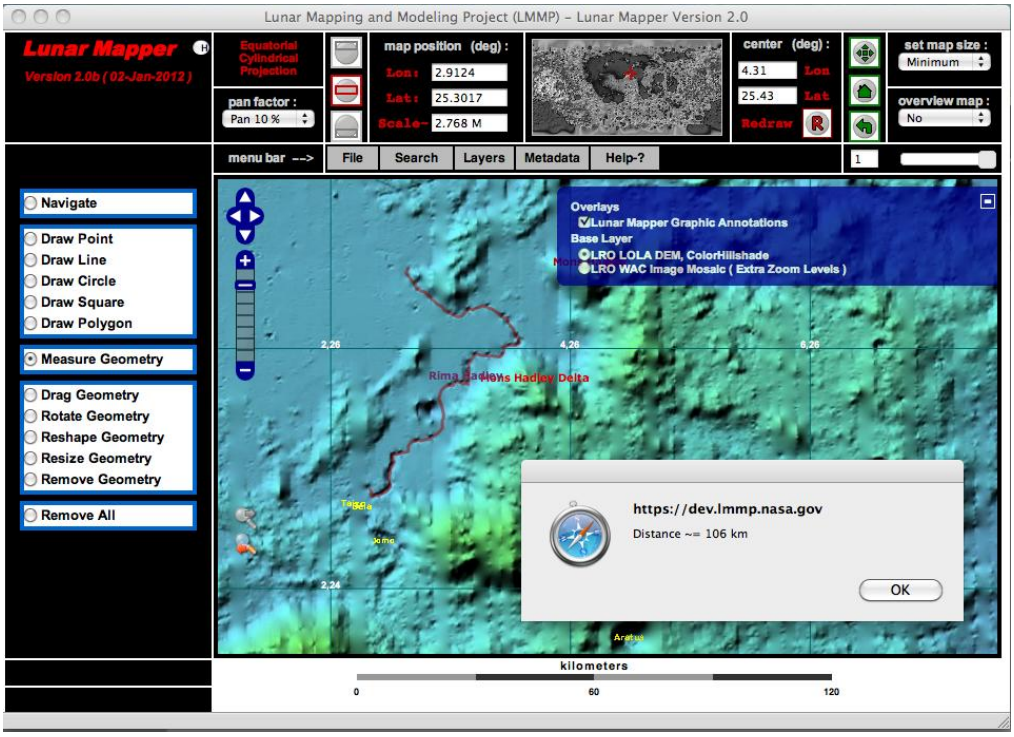

Figure 8.5. Annotations.

The approximate length of the Hadley Rille feature can be determined using the *Measure Geometry* tool as shown in Figure 8.5.

You can add additional annotations to map such as:

- Points of interest.
- Area of interest (Polygon).

This is demonstrated by looking at iron abundance on a region of the Moon. Figure 8.6 shows the *LP GRS Iron Abundance* map in the region surrounding Mare Fecunditatis; blue indicates high iron abundance. The underlying topography can be shown by turning on the transparency of the iron layer. The iron layer is selected as shown in Figure 7.6, and then the transparency can be changed using the slide control on the right edge of the menu bar. Figure 8.7 shows the result of this change. With the opacity at 0.5, the base layer is visible, showing

that one of the regions of high iron content corresponds to the Mare Fecunditatis.

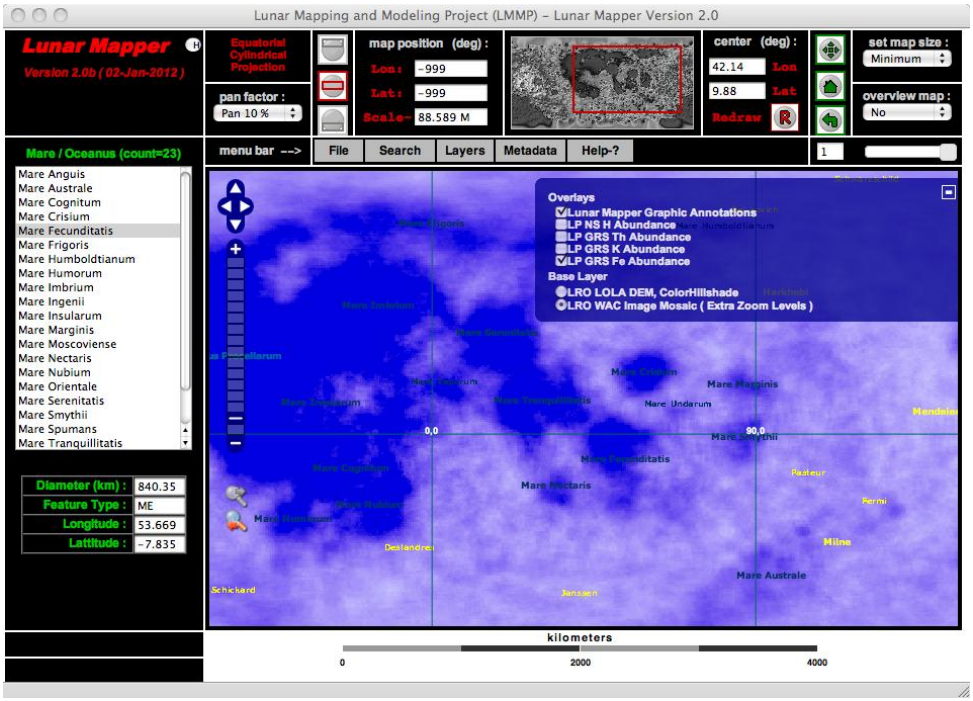

Figure 8.6. Iron abundance in the region surrounding Mare Fecunditatis.

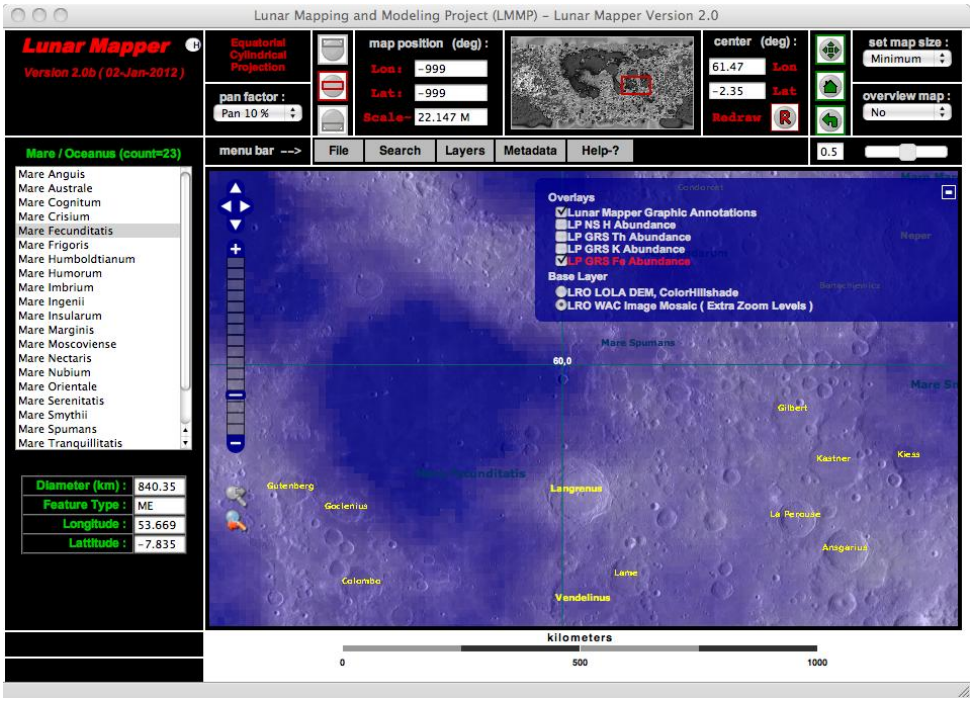

Figure 8.7. Iron abundance layer is transparent, showing the underlying topography.

This can be further explored by determining the area of the region of increased iron abundance by drawing a polygon that encloses the blue region and using *Measure Geometry* to display the area of the polygon as shown in Figure 8.8.

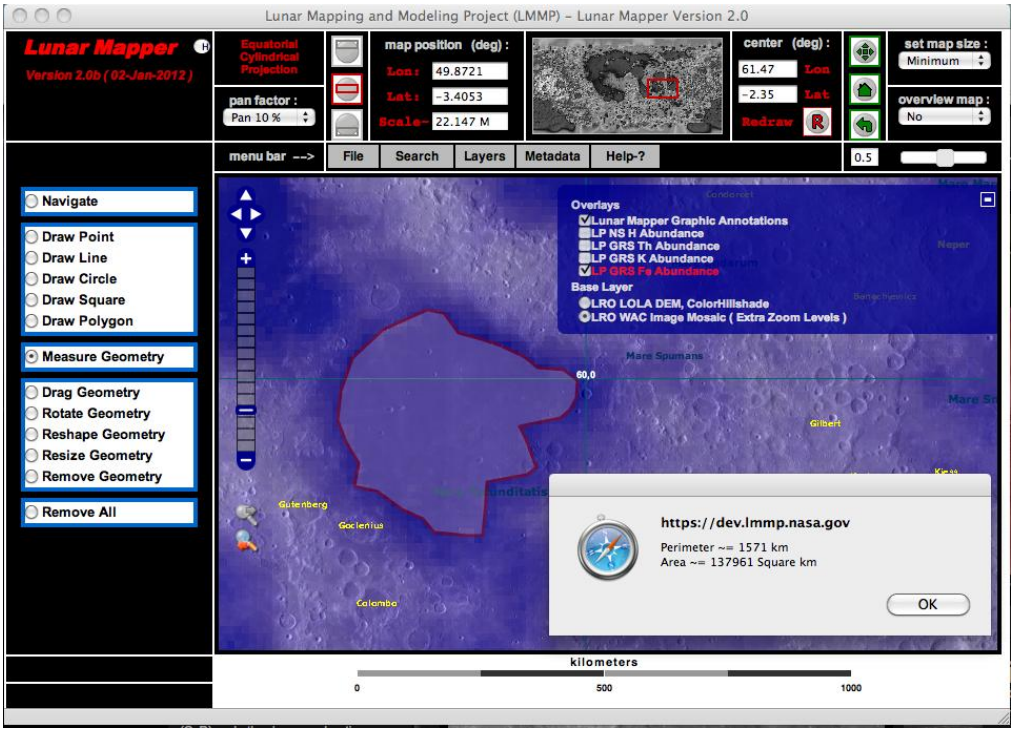

Figure 8.8. Area of the polygon enclosing the approximate region of elevated iron abundance region is computed using map annotation tools.

9 Known Issues and Workarounds

9.1 Window maximize button for OS doesn't enlarge map view properly as expected

9.1.1 Issue

The maximize button for the window maximizes the window, but the *Map View* does not size with it (lots of white space if screen is large). Affected browsers are Safari for Mac, Firefox for Mac, Firefox for Windows, and Safari for Windows. This does not effect LM functionality, only the appearance.

9.1.2 Workaround

To set the map size to the full screen size or other sizes, use the set map size pull-down menu in Lunar Mapper.

9.2 Scale bar

9.2.1 issue

Scale bar in equatorial view is only accurate near the equator.

9.2.2 Work around

When near poles (± 65 deg Lat) use polar projections.

9.3 Keyboard arrow keys and pan factor pull-down menu

9.3.1 Issue

In Safari, when you are using the up/down arrow key, the %pan changes as the layer moves if the focus is still on the Pan factor pull-down menu. In Firefox the up/down and right left arrow keys change the pan factor while it pans. Affected browsers are Safari for Mac, Firefox for Mac, and Firefox for Windows.

9.3.2 Workaround

Choose another control such as the map position text box (that is, change focus from the pan factor menu).

9.4 Nomenclature toggles off

9.4.1 Issue

Zooming to full extents sometimes turns off nomenclature.

9.4.2 Work around

Use *Layers* > *Toggle Overlays* to turn nomenclature back on.

9.5 iPhone 4 / iPad compatibility

Limited testing has been done using Safari on the iPhone 4 / iPad. Though Lunar Mapper works in this environment, we note the following issues encountered.

9.5.1 Cannot login to portal with iPhone 4 / iPad

9.5.1.1 Issue

The Portal uses Flash Player and it is not currently supported on the iPhone 4 / iPad, so Lunar Mapper cannot be launched through the standard Portal Interface with an iPhone 4 / iPad.

9.5.1.2 Workaround

Login using

http://pub.lmmp.nasa.gov/lunarmapper/lm.html?host=pub.

This provides a place to access Lunar Mapper without using the Flash Player interface.

9.5.2 Reporting coordinates in iPhone 4 / iPad

9.5.2.1 Issue

Dragging your finger over a map does not change coordinates in the position box in the same way that moving the curser with a mouse works.

9.5.2.2 Workaround

Touching the screen at a point on the *Map View* updates that location information in the position box.

9.5.3 Multi-touch screen navigation does not work intuitively

9.5.3.1 Issue

Pan and zoom functions that are normally done with a mouse do not work.

9.5.3.2 Workaround

To pan *Map View*, use blue pan buttons. To zoom out in on the *Map View*, use the magnification bar (+) and (-) buttons.

9.5.4 Pan control buttons are hard to pick with iPhone / iPad

9.5.4.1 Issue

They work, but sometimes it is hard to pick them.

9.5.4.2 Workaround

Zoom in (multi-touch zoom by stretching two fingers apart) to enlarge the buttons to use them.

9.5.5 + – buttons on magnification bar are hard to pick at default iPhone / iPad zoom level

9.5.5.1 Issue

These can be used if you zoom in, but they are hard to use if they are at default view.

9.5.5.2 Workaround

Zoom in (multi-touch zoom by stretching two fingers apart) to enlarge the buttons to use them.

9.5.6 Cannot draw Map annotations on iPhone / iPad

9.5.6.1 Issue

The default functionality of the multi-touch screen does not support the double clicking needed to terminate lines and polygons, or dragging needed to create circles and squares. Thus, these geometries cannot be drawn using the current version of Lunar Mapper using the iPhone / iPad. Points can be drawn using iPhone / iPad. You cannot drag or resize map annotations either.

9.5.6.2 Workaround

No workaround at present.

9.5.7 Operation of Layer Transparency slider

9.5.7.1 Issue

Cannot slide the slider by dragging your finger across the multi-touch screen.

9.5.7.2 Workaround

The slider will move if you tap the screen at the point where you want the slider to move to. The opacity value of the layer (0-1) is updated appropriately.

10 Copyright information

The map area of Lunar Mapper is driven by OpenLayers JavaScript API, copyright(c) 2005–2008 MagnaCarta, Inc.

Some overlay layers are served via FWTools (Frank Warmerdam) and UMN (University of Minnesota) MapServer.

Overview Map images are extracted from the Arizona State University (ASU) Apollo WMS Server (NASA/JSC/AS)